

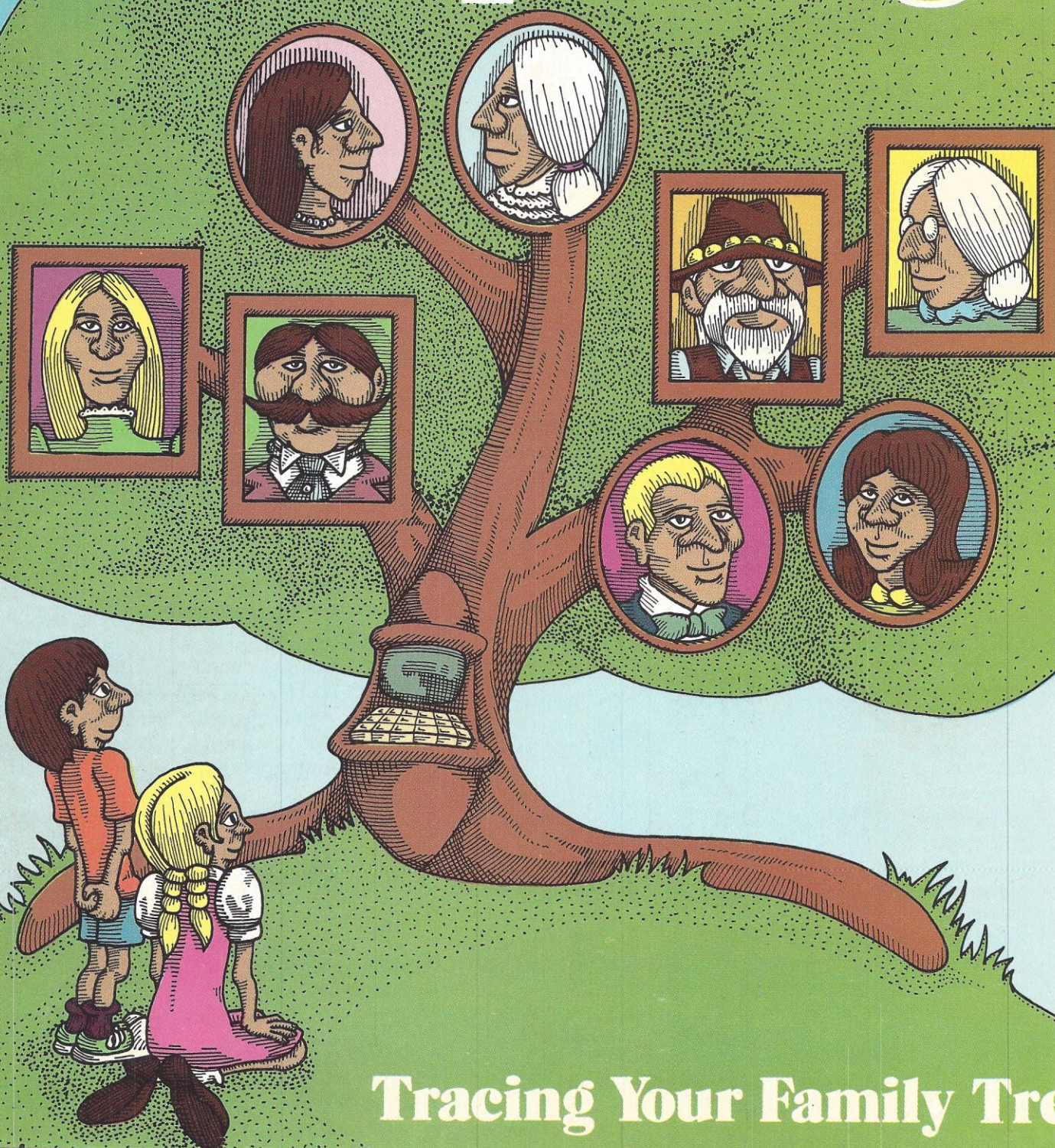
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Then check
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☒ **Check Printer Quality**

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☒ **Check Convenience**

For operating ease, the DP-8000 accepts paper through the rear or bottom of the unit, provides programmable Skip

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☒ **Check the low Price**

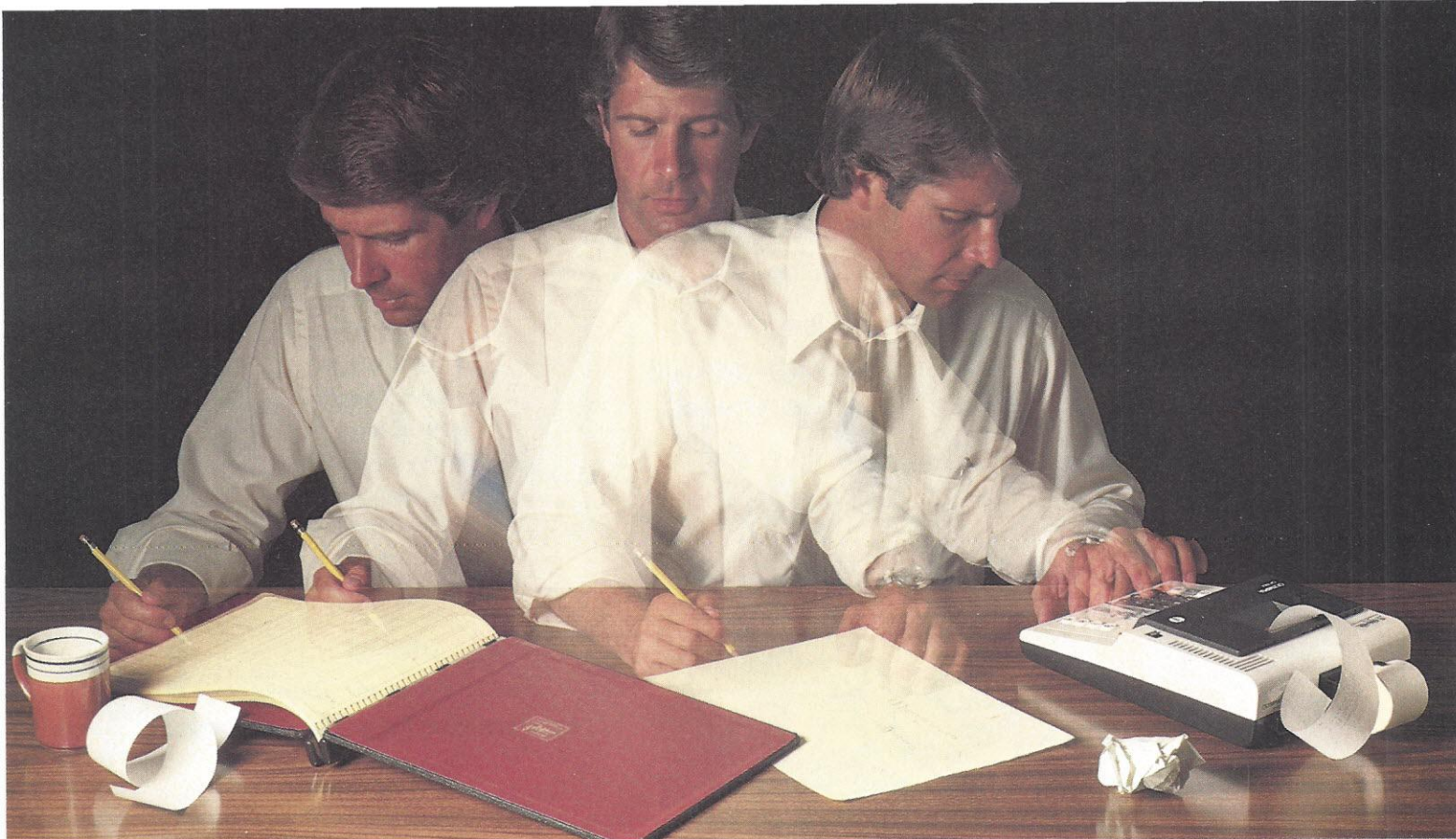
The best news is the price. A complete DP-8000 is unit-priced at under \$1000, with substantial discounts in larger quantities.

Once you've checked out the performance and price, we think you'll agree that the DP-8000 is definitely worth checking into. Contact us today for complete details and a demonstration.

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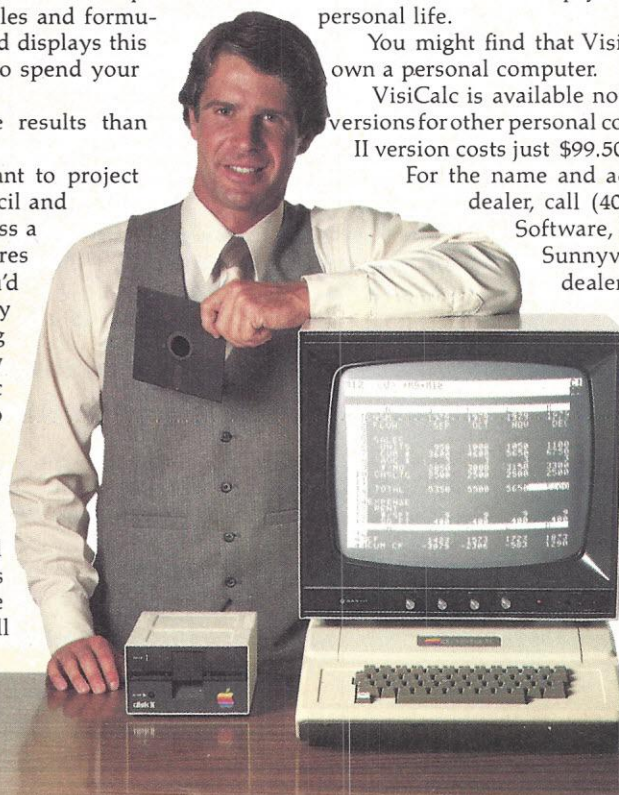
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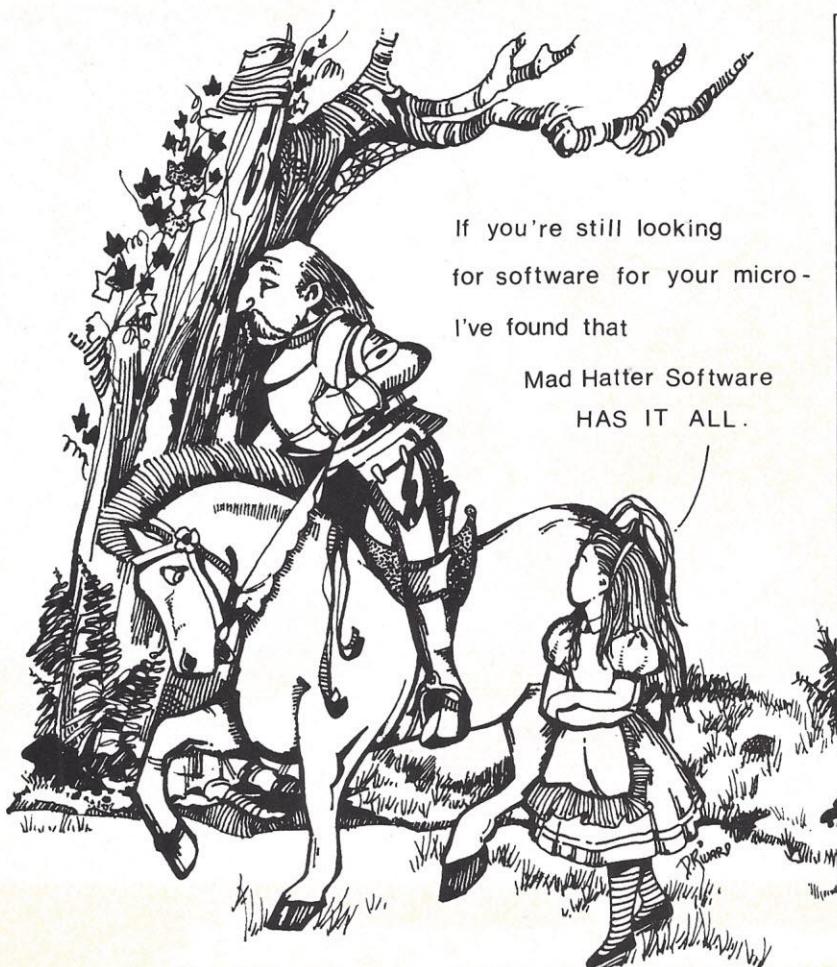


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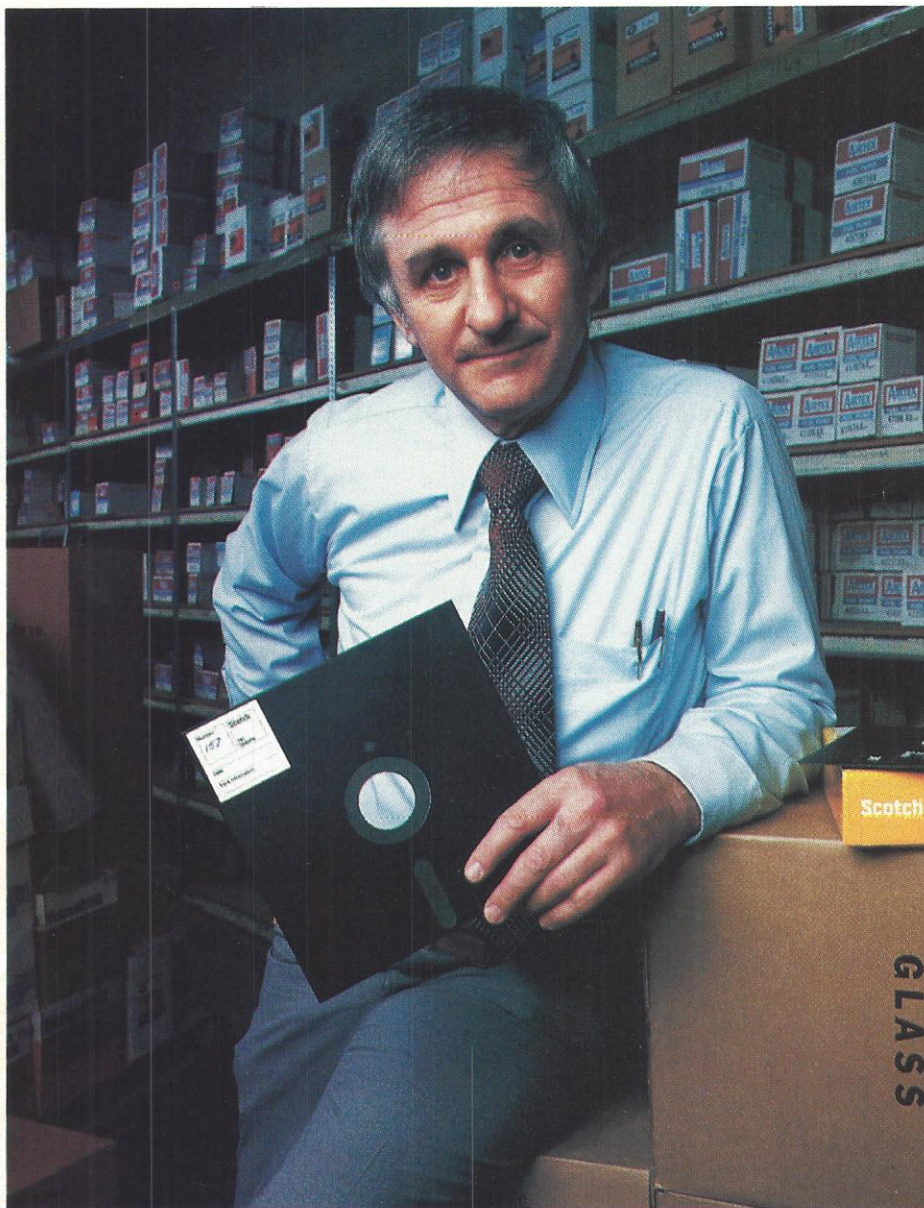
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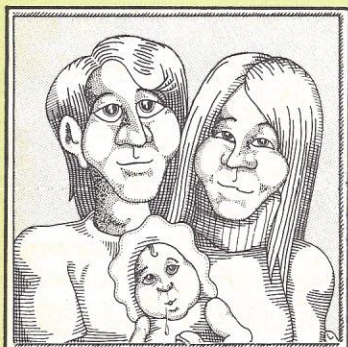
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Page 41

COVER STORY

Roots and Branches41

Anyone can use this genealogy program to trace and organize their family history. The program prints trees of ancestors and descendants for any member of your family. You can quickly retrieve, review and change detailed information on anyone in your family tree. *by John J. Armstrong*

LAUNCHING PAD

How to Program a Complex Problem26

Even a relatively simple game may prove surprisingly complex when you try to program it on a computer. This author lets you look inside his mind as he tackles a problem step by step, giving you insights that will help your own programming efforts in your business or home. *by Bruce D. Barnett*



Page 38

DIGGING IN

Measuring Readability of Text34

Just type in a sample of text and this program will use established scientific formulas to tell you how "readable" the text is. *by Steve Irving and Bill Arnold*

Exam55

This general-purpose program lets teachers create exams on any subject, then automatically score student responses. *by Loyd Bulmer*

IN THE MONEY

Electric Usage Analysis Program18

Using this simple program to analyze patterns of electricity usage can help you save money. In addition, the same program will also analyze usage of water, gas or similar utilities. *by Howard Berenbon*

Small Business Invoicing32

This simple invoicing program, written for the TRS-80, lets you quickly and easily print invoices for your small business. *by Dan Obed*



Page 67

ON THE LIGHTER SIDE

Who Am I?38

This fun quiz game teaches children (and adults!) about Biblical characters. *by John Palmer*

DEPARTMENTS

FEEDBACK	7
RANDOM ACCESS ...	10
COMPUTER CHESS ..	59
COMPUTER GAMES ..	67
COMPUTER BRIDGE .	71
WHAT'S COMING UP .	75
AD INDEX	94

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Explorer/85 Professional Computer

Starting at just \$129.95 for a Level "A" operating system, you can now build the exact computer you want. Explorer/85 can be your beginner's system, OEM controller, or IBM-formatted 8" disk small business system...yet you're never forced to spend a penny for a component or feature you don't want and you can expand in small, affordable steps!

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For just \$129.95 (plus the cost of a power supply, keyboard/terminal and RF modulator, if you don't have them already), Explorer/85 lets you begin computing on a significant level...applying the principles discussed in leading computer magazines...developing "state of the art" computer solutions for both the industrial and leisure environment.

Like all Netronics products, each level of Explorer/85 is engineered to professional standards. Top quality components are used throughout. You are insured, year after year, of stable, reliable service.

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No matter what your future computing plans may be, Level "A" is your starting point.

Level "A" Specifications

Explorer/85's Level "A" system features the advanced Intel 8085 cpu, an 8355 ROM with 2k deluxe monitor/operating system, and an 8155 ROM-I/O—all on a single motherboard with room for RAM-ROM/PROM/EPROM and S-100 expansion, plus generous prototyping space.

(Level "A" makes a perfect OEM controller for industrial applications and is available in a special Hex Version which can be programmed using the Netronics Hex Keypad/Display.)

PC Board: glass epoxy, plated through holes with solder mask • I/O: provisions for 25-pin (DB25) connector for terminal serial I/O, which can also support a paper tape reader...provision for 24-pin DIP socket for hex keypad/display...cassette tape recorder input...cassette tape recorder output...cassette tape control output...speaker output...LED output indicator on SOD (serial output) line...printer interface (less drivers)...total of four 8-bit plus one 6-bit I/O ports • **Crystal Frequency:** 6.144 MHz • **Control Switches:** reset and user (RST 7.5) interrupt...additional provisions for RST 5.5, 6.5 and TRAP interrupts onboard • **Counter/Timer:** programmable, 14-bit binary • **System RAM:** 256 bytes located at F800, ideal for smaller systems and for use as an isolated stack area in expanded systems...RAM expandable to 64k via S-100 bus or 4k on motherboard.

Monitor ROM (ASCII Keyboard Version): 2k bytes of deluxe system monitor ROM located at F800 leaving 0000 free for user RAM-ROM. Features include tape load with labeling (so that Explorer/85 can locate your specific program automatically)...tape dump with labeling...examine/change contents of memory...insert data (such as from a paper tape reader)...warm start (a feature which is especially helpful in debugging routines as it allows you to save the contents of the registers which might otherwise be lost along with the rest of your program when a bug causes it to self-destruct. The warm start feature helps you pinpoint the exact line in your program that contains an error)...examine and change all registers...single step with register display at each break point, a debugging/training feature...go to execution address...move blocks of memory from one location to another...fill blocks of memory with a constant...display blocks of memory...automatic baud rate selection...variable display line length control (1-255 characters/line)...channelized I/O monitor routine with 8-bit parallel output for high speed printer...

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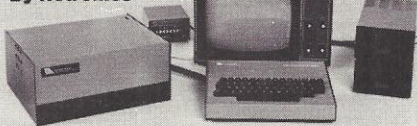
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- ☐ Explorer/85 Level "A" Kit (Hex Version), \$129.95 plus \$3 p&h.
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- ☐ 8k Microsoft BASIC in ROM Kit (requires Levels "B," "D," and "E"), \$99.95 plus \$2 p&h.
- ☐ Level "B" (S-100) Kit, \$49.95 plus \$2 p&h.
- ☐ Level "C" (S-100 6-card expander) Kit, \$39.95 plus \$2 p&h.
- ☐ Level "D" (4k RAM) Kit, \$69.95 plus \$2 p&h.
- ☐ Level "E" (EPROM/ROM) Kit, \$5.95 plus \$06 p&h.
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- ☐ Deluxe Steel Cabinet for ASCII Keyboard/Terminal, \$19.95 plus \$2.50 p&h.
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- ☐ RF Modulator Kit (allows you to use your TV set as a monitor), \$8.95 postpaid.
- ☐ 16k RAM Kit (S-100 Board expands to 64k), \$199.95 plus \$2 p&h.
- ☐ 32k RAM Kit, \$329.95 plus \$2 p&h.
- ☐ 48K RAM Kit, \$459.95 plus \$2 p&h.
- ☐ 64k RAM Kit, \$589.95 plus \$2 p&h.
- ☐ 16k RAM Expansion Kit (to expand any of the above up to 64k), \$139.95 plus \$2 p&h each.
- ☐ Intel 8085 cpu User's Manual, \$7.50 postpaid.
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- ☐ 12" Video Monitor (10 MHz bandwidth), \$139.95 plus \$5 p&h.
- ☐ North Star Double Density Floppy Disk System (One Drive) for Explorer/85 (includes 3 drive S-100 controller, DOS, and extended BASIC with per-

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serial console in and console out channel so that monitor can communicate with I/O ports.

Monitor ROM (Hex Version): Tape load with labeling...tape dump with labeling...examine/change contents of memory...insert data...warm start...examine and change all registers...single step with register display at each break point...go to execution address.

Level "B" Specifications

Level "B" provides the S-100 signals plus buffers/drivers to support up to six S-100 bus boards and includes: address decoding for onboard 4k RAM expansion selectable in 4k blocks...address decoding for onboard 8k EPROM expansion selectable in 8k blocks...address and data bus drivers for onboard expansion...wait state generator (jumper selectable), to allow the use of slower memories...two separate 5 volt regulators to insure maximum stability and a noise free bus.

Level "C" Specifications

Level "C" expands Explorer's motherboard with a card cage, allowing you to plug up to six S-100 cards directly into the motherboard. Both cage and cards are neatly contained inside Explorer's deluxe steel cabinet. Level "C" includes a sheet metal superstructure, a 5-card gold plated S-100 extension PC board which plugs into the motherboard, 12 card guides, and all brackets and hardware needed for complete assembly. Just add required number of S-100 connectors.

In addition to six S-100 cards, Level "C" will also support an optional test socket that allows you to perform tests and maintenance on both sides of any individual S-100 card, under actual operating conditions. (You won't need Level "C" unless you are planning to use 3 or more S-100 cards with your Explorer/85.)

Level "D" Specifications

Level "D" provides 4k or RAM, power supply regulation, filtering decoupling components and sockets to expand your Explorer/85 memory to 4k (plus the original 256 bytes located in the 8155A).

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Level "E" Specifications

Level "E" adds sockets for 8k of EPROM to use the popular Intel 2716 or the TI 2516. It includes all sockets, power supply regulator, heat sink, filtering and decoupling components. Sockets may also be used for soon to be available RAM IC's (allowing for up to 12k of onboard RAM).

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Level II Robots

Dear Editor:

I have just completed copying "Robots" on my Level II TRS-80 from the June 1979 issue of *Personal Computing*. This is one of the most entertaining easy-to-enter games that I have derived from my PC issues to date. It is also one of the few games I've seen recently which does not need a disk system.

The only problem I had with the program was one related to Level II BASIC. Statement 3050 INPUT M caused line 11 of the display to be erased after each move was entered.

This was corrected by changing statement 3000 to:

```
3000 PRINT@ 945; "MOVE";
```

This change places the cursor at the bottom of the screen so only the bottom line of the playing field is erased on each move. In addition, I modified statement 3200 to re-draw the bottom line of the playing field by the following:

```
3200 FOR I = 93 TO 4 STEP -1: SET (I,45):  
NEXT I
```

After these changes were made the program worked very well and I expect it will provide many hours of entertainment for my family and friends.

Larry R. Hamilton
Crown Point, IN

Depreciation Update

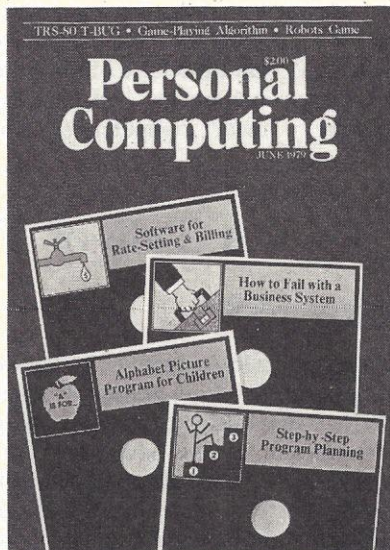
Dear Editor:

We were very pleased with Karen Wolfe's "Appreciating Depreciation" program published in the May 1979 issue of *Personal Computing*.

Our firm operates with a Radio Shack TRS-80, using Disk BASIC language, and we were unable to run the program because of one symbol that was used, different from our characters.

Could you please explain the function of the character % used in the lines 1165 and 1230 of the program?

We appreciate any help, and again



compliment Karen Wolfe on this useful program.

Electrocomm Corporation
David F. Eisenberger, President
Cleveland, OH

Author's note: Mr. Eisenberger — I hope the following solves your problem of adapting my depreciation program written in North Star BASIC to your TRS-80's version of BASIC.

In North Star BASIC, a formatting string must begin with the (%) character, followed by the number of total characters desired in the field, followed by "F", followed by the number of places desired to the right of the decimal point and finally followed by a comma and the variable you wish to be printed in your designated format.

For example, in line 1165 of the depreciation program, the format string is "%9F2" which was followed by "B". I wanted the variable "B" printed in a 9 character field and rounded to two places right of the decimal.

You can replace these format strings in line 1165 and 1230 with whatever format instructions exist in your version of BASIC. In line 1165 you are formatting the variable "B". In line 1230, the variables S(C), A(C) and B(C) are formatted.

Of course, you could just have the variables printed out without formatting them. But that makes for sloppy

printouts and numbers with several places to the right of the decimal point.

I hope this solves the problem. I am simply not familiar with the TRS-80 version to tell you exactly what instructions to use. If this does not solve the problem, perhaps your computer dealer can demonstrate the TRS-80's formatting capabilities to match the formats I've used in the "Appreciating Depreciation" program.

Good luck and happy programming.
— Karen S. Wolfe

Credit Due

Dear Editors:

I wish to express my thanks to you for publishing my article "1/f Random Tones". It was done very well and I am much pleased with the results. However, you neglected to include the following credit reference:

"1/f noise" in music: Music from 1/f noise, Richard F. Voss and John Clarke, Dept. of Physics, University of California; and Materials and Molecular Research Division, Lawrence Berkeley Laboratory, Berkeley, California 94720, January 1976.

Anthony T. Scarpelli
N. Windham, ME

Editor's note: We apologize for omitting the credit reference and thank Mr. Scarpelli for bringing it to our attention. — M. M.

Computer Commodities Trader

Dear Editors:

I purchased several back issues of *Personal Computing*, and while reviewing them I came across the letter in the Feedback section (July 1978) from Sharon Jackson, Fenton, MO, asking about information on commodities futures trading with a home computer.

I am also a part-time investor with limited capital and limited program-

ming experience. As a relatively new home computer enthusiast, I initially purchased a 32K Polymorphic 8813 with two disk drives to attempt to develop my own programs for the market averages and stocks. However, in the meantime, I could find no software suitable or adequate for my purposes until I could develop my own programs. So in the process of trying to find compatible market software, I came across a commodity software package developed by Comm Basic Associates in Dayton, OH.

But to use this software, developed for North Star Disk Controlled Basic, I had to convert my Poly to North Star to make the systems compatible. And am I glad I did. The Comm Basic programs switched me from stocks to commodities and saved me untold programming hours, and I now consider myself a successful electronic-aided commodities trader with my home computer.

The Comm Basic Commodity Programs are rather extensive and complex with highly sophisticated applications, but are simple and easy to use with plain English computer prompting. My first trade with the program was to buy July '79 corn futures, which I am still holding with a long term gain (long term is 6 months for commodities versus 12 months for stocks).

With the software package I also purchased a Diablo Model 1345A Printer and the Michael Shroyer Electric Pencil word processor program. Words alone cannot describe the capabilities of these two programs and the ease and accuracy of their use.

Dr. Robert L. Ward
Charlotte, NC

Editor's note: Comm Basic's Trader computer system was designed for commodity traders and hedgers allowing them to "spend their time analyzing the data that our Trader has done the number crunching on," said company president J. A. N. Gagliano, Sr. "As a trader or hedger you shouldn't have to worry about how a computer works or how to program it. You should only concern yourself with how to use the computer as a tool in trading." Among other functions, the system will calcu-

late moving averages, demand index, spreads, oscillators and relative strength. Comm Basic also offers word processing, mailing list and business software. Trader computer systems

cost from \$4750 to \$8495.

For more information, contact Comm Basic, Inc., 7920 Chambersburg Road, Dayton, OH 45424; (513) 233-9904. — D. W.

A Tale of Two Companies

Software 80

Editor's Note: In August *PC*, p. 10, we published a letter from Warren R. Jones detailing his difficulty in contacting Software 80, a *PC* advertiser. Mr. Jones had purchased about \$300 worth of software from the company. When he returned the licensing agreement to Software 80, the Post Office returned it marked "Moved — left no address." When he tried calling the company, he found the phone was disconnected.

In our reply, we noted that several other readers had had similar problems contacting the company, as we had ourselves, and that the company was apparently out of business. We sent a letter explaining the situation to the Attorney General of California, along with a copy of Mr. Jones' letter. We received the following reply:

"Thank you for bringing your consumer complaint to our attention. Often, it is only through letters from concerned and responsible citizens that our office becomes aware of consumer problems.

"This firm (Software 80) has apparently gone out of business. It appears that it is extremely unlikely that you can receive any return on your investment.

"The Attorney General is prohibited by law from representing private individuals in legal actions, so we cannot represent you in a lawsuit against this company. However, we will keep your complaint on file in case we take some legal action on behalf of the people of California against this company at a future date."

(Signed)
Robert Raymer
Consumer Protection Analyst
(for)
George Deukmejian
Attorney General

After the August issue was published, we received a phone call from David Mazer of Software 80, saying that his company was in business and had never been out of business. He said he doesn't understand why some mail was returned by the Post Office. The company's address remains the same: 18288 Cabrillo Court, Fountain Valley, CA 92708. The company's phone number is (714) 964-5384. (The phone number in the company's May *PC* ad has been disconnected.)

Readers who've had problems with Software 80 should contact the company at the address and phone number above. — D.W.

World Power Systems

Editor's note: World Power Systems executives Norman Henry Hunt and Dinah T. Robinson are in custody and awaiting trial in Federal court, according to Rex Angeley of the Pima County Attorney's Office in Tucson, AZ.

Hunt and Robinson, who posed as the husband and wife team of James and Lee Anderson, were involved in the bogus mail-order company, which operated out of Tucson. Federal officials called the scheme a "double bust out". World Power Systems sent out financial data to suppliers and placed ads to consumers. Equipment was bought on credit and cash orders were taken from customers. WPS never paid the suppliers, and sent out only enough equipment to try to appear legitimate, according to the Pima County Attorney's Office.

World Power Systems advertised with a six-page insert in the June issue of *PC*. Readers are warned not to order from this company. For more details on the case, see our Editor's memo in the July *PC*. — M.M.

Pet Peculiarity

Dear Editor:

The article "Three Practical Programs" in your July 1979 issue has three of the 76 programs from my book *Some Common BASIC Programs*. It turns out that one of the three, Day of the Week, does not work right on the Commodore Pet. This is due to an anomaly of Pet arithmetic.

We fixed the program on our Pet by adding this new line:

145 N=N

Sorry for any inconvenience to pet users.

Lon Poole
Osborne & Associates
Berkeley, CA

Editor's Note: The listings in *Some Common BASIC Programs* cover finance, math, statistics and general interest subjects. The book costs \$9.50. The programs from the book are also available on a Pet cassette for \$10. Order from Osborne & Associates, Inc., 630 Bancroft Way, Berkeley, CA 94710; (415) 548-2805. —D.W.

Boris Bugs

Dear Editors:

I am 11 years old and I have had a very bad experience with a chess game called Boris. When I made any move that would capture any of the machine's pieces, Boris would print out a message on the LED display that said my move was illegal. What should I do? Debug it? It cost \$300.

Blair E. Gensamer
St. Louis, MO

Editor's Note: We have played with Boris several times and experienced the same situation. The problem lies in arrangement of the chess pieces. Often-times a previous legal move has been made which has left a chess piece on the square you want to go to, or has interjected a piece in the path of the piece you are moving. This happens when

you key in a previous legal move: f3 can become f4 or g3 because your finger may have slipped and you may have put the chesspiece on a different square on your own chessboard. Solution: erase Boris's position arrangement in its memory and replace the pieces according to your own chessboard.

—H.S.

Spelling Bee Changes

Editor's Note: One of our readers, Q. A. Hardin, had trouble getting the "Spelling Bee for a PET" program (September 1978) to work properly. The problem lay in getting the spelling word to blink off the screen after 1/6 second. Mr. Hardin solved the problem with the following changes:

"Incorporate the changes in Feedback, December 1978. Lines 122, 155 and 165 should read:

122 ?"SHIFT:CLR/HOME":

and so forth. Line 130 should read:

130 ?A\$

It works wonderfully; I get best results by extending line 5 to read A = 30 to give beginners a better look at the word, then going back to A = 20 when they are ready for it." —D. W.

Menu Planning Notes

I am trying to write the Menu Planning program (February 1979) for the Pet but there seem to be a few things missing. First, what system was this program written for?

There seems to be some information missing. The printed-out menu shows 121 items. There are only 93 items in the data tables.

Please explain CHR\$(16);CHR\$(22). If I knew what they do in the system this program was written for, I could come up with the proper Pet commands.

Also, there are errors in lines 990 and 995. Both are IF-THEN statements say-

ing if the number is less than zero. A digit was dropped someplace.

I would appreciate any information you can give.

Bernhardt Sandler
Venice, CA

Author's Note: The system the program was written for consisted of MITS disk extended BASIC version 3.4, 48K memory, 2 disks, Southwest CT-1024 terminal. "CHR\$(16); CHR\$(22)" clears the screen and homes the cursor of the CT-1024 terminal.

Lines 990 and 995 are correct. The standards for vitamin D and E have been set to zero. If you would like to set a higher standard for these nutrients, replace the zeros with the appropriate values.

Nothing is missing from the data list! All menu items through #93 have data stored for them in data statements. The Menu items after #93 are only used in printing shopping lists of items to be purchased. Items #94 to 121 are used in making main courses and salads.

For example, look at Menu item 10: hamburger with roll, lettuce, tomato and catsup. Its data statement contains the aggregate of the nutrients of the entire main course, not just the meat.

When the program prints out the shopping list, it calculates the number of total pounds of ground meat, how many hamburger rolls, lettuces, tomatoes and catsup are required to make the required number of hamburger dinners.

—Sam Newhouse

Research Retrieval

Editor:

I found the article "Foto Finder" (July PC) by Loyd Bulmer interesting, informative and flexible. I have personally adapted the program to retrieve certain medical facts quickly and accurately. Mr. Bulmer's retrieval and combinational executions are very useful, and most certainly will enable me to finish my research much faster.

Randy E. Langston
Hampton, VA

RANDOM ACCESS

Play Like a Pro at Pebble Beach

You've just received that long-awaited set of new golf clubs and can't wait to try them out. But there is four feet of snow outside.

As a beginner, your golf score has never seen the southern side of 125. But wouldn't it be exciting to play championship courses like Pebble Beach or Spy Glass Hill in privacy, at your own pace?

You live in a midwestern plains state where you can see over the highest spot in the county. Wouldn't it be a nice challenge to face the hazards of hills, trees and rocks on an ocean-side championship golf course?

Optronics, Ltd. of Salt Lake City, Utah, has solved these problems with the development of "Par-T-Golf, the Incredible Golf Machine", that offers the opportunity to play a choice of major golf courses using your own clubs, developing your own swing, but never walking more than 15 feet at any one time.

Par-T-Golf is an extension of the indoor golf range where you merely drive a ball into a net, or at a screen on which some pictures are projected. It uses the capabilities of the TMS9900 16-bit microprocessor from Texas Instruments to provide a complete, realistic simulation of a variety of championship golf courses. Only, the games are indoors.

Designed for arcades, golf clubs, pro shops or any form of recreational facility, Par-T-Golf occupies a 35 x 14 foot area and comes complete with tee and fairway areas, simulated rough and sand traps and an artificial putting green.

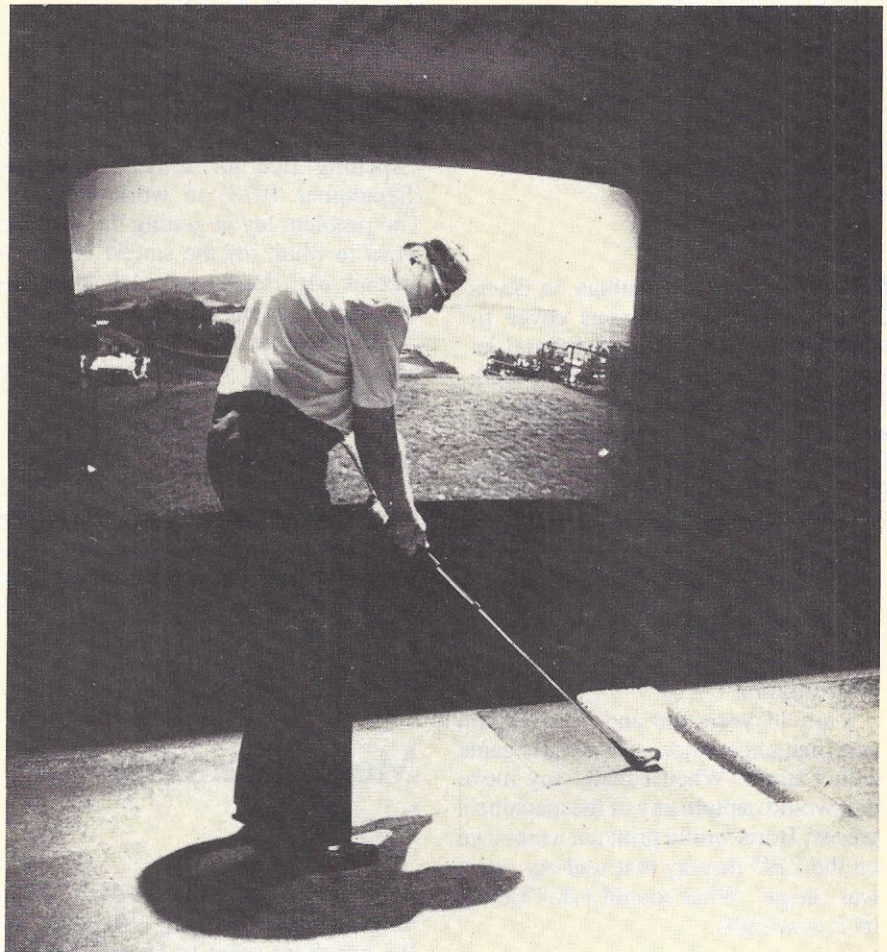
Balls are driven into a tough, polypropylene-covered nylon screen upon which pictures of the golf course are projected. As the ball is hit, it passes under three infrared-scanning units that track the exact flight of the ball.

The scanners are set in the ceiling with the first two 26 inches apart aiming straight down to measure speed and angle off the tee. The third projects out at an angle to measure height and the degree of slice or hook. Infrared light used by the sensors does not interfere with the 1000 W filmstrip projector.

When the ball passes through

scanner and #250 on the second scanner, the ball is obviously headed far off to the right.

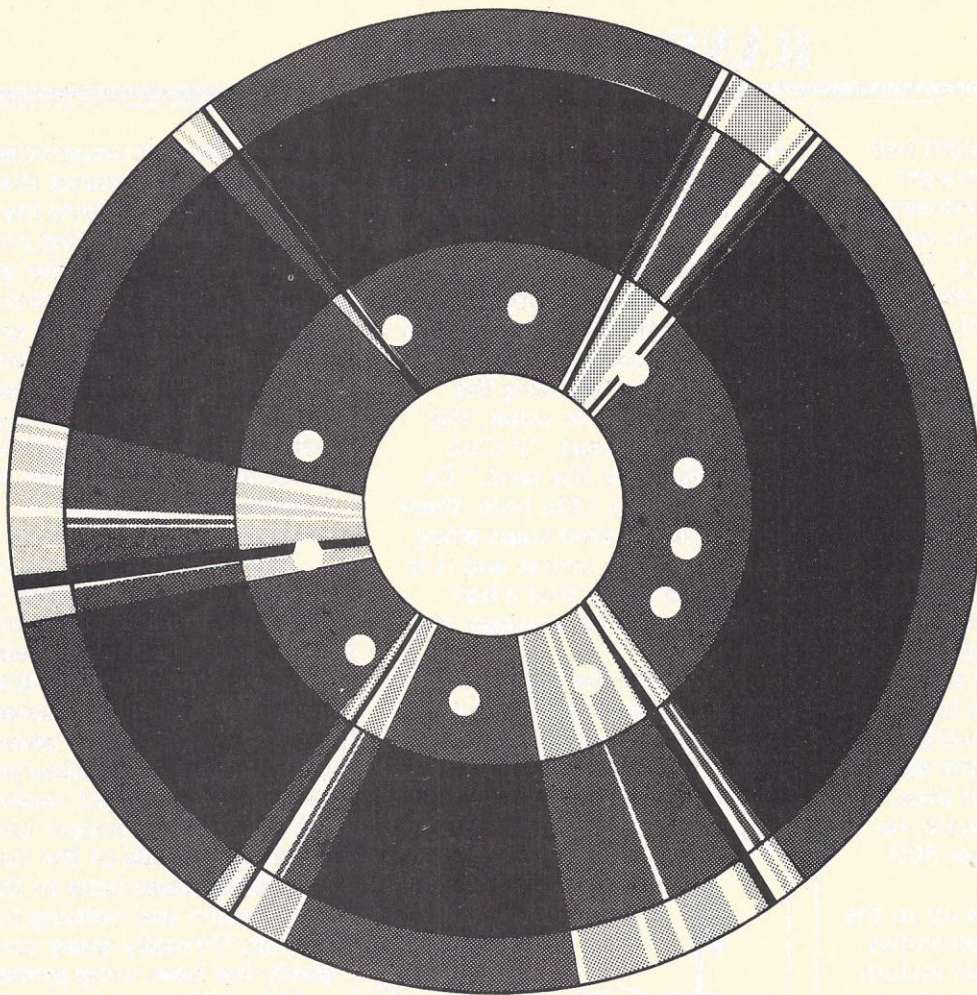
The third sensor is aimed down at an angle towards the screen to measure the altitude of the ball's trajectory. Again, the measurement of the time differential between when the ball leaves the beam of the second scanner and when it reaches the beam of the third indicates the height to which the ball was hit.



the first two sensors, the system is able to calculate the speed of the ball by the time differential as it passes through the two IR beams. The unique image sensors are also able to calculate the azimuth of the ball off the tee by sensing which of 512 photodiodes the ball passes under. For example, if the ball passes under photodiode #100 on the first

A ball hit very low would cover a longer distance between the two beams and therefore take a longer time. One hit very high would cross the beams in less time. Simple number-crunching by the microprocessor computes the angle very quickly.

The last calculation represents the degree of hook or slice. The screen is curved in such a manner



**It
isn't
in
the
hole**

it's on the doughnut!

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The end user's microcomputer must satisfy the following requirements:

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CIRCLE 8

so that a perfectly straight ball with no spin will fall straight back from the screen. However, any spin imparted to the ball will cause it to hook or slice. The degree of spin can be calculated by the angle at which the ball deflects from the screen. This is then translated into a distance in yards to the left or right of center-fairway.

In order to provide the golfer with an accurate visual reference to the course being played, Optronics took a series of aerial photographs of Pebble Beach and other golf courses. The course was then divided up into squares, thirty-three yards on a side. Photographs were then taken on the ground looking towards the flag from each one of the squares indicated on the master plan. Pebble Beach, for example, requires a filmstrip of over 800 photographs.

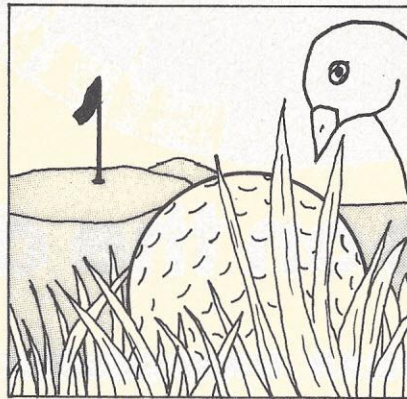
When a golfer stands up to the tee, the first photograph shows him a layout of the hole including distances, placement of hazards, position of the green and the flag. The next picture shows the view from the tee from which he is playing. After the golfer tees off, the film advances to that square in which the ball has landed. The TMS9900-based system calculates trajectories within an accuracy of one foot. Thus, the next picture shows the view that a golfer would see if he were actually on the course.

Off to the side, a display indicates the distance the ball was hit, how far off center it is and how far it is to the green. The player then either retrieves his ball or places another one on the playing surface, selects the correct club for the distance involved, and continues on.

Some of the holes on the Pebble Beach course are quite narrow and it is quite easy to go out of bounds. For example, the 18th hole plays right along the waters edge. A hook, and your ball will enjoy the company of the Pacific Ocean seals. When the ball does go into the water, the next picture on the screen is the

view from that point. The filmstrip then reverses itself to show that point at the edge of the course where the ball went out of bounds. The display will then indicate the proper drop distance and show the view from which the ball should be played. For example, after showing the photograph of the water, the display might read, "2 Club Drop. Barely in the sand." Especially on the 18th hole, there are a series of sand traps along the edge of the course and it is more than likely that a ball would have to be dropped in the sand.

Another of the interesting aspects of Par-T-Golf is the challenge when a ball goes into the rough. The filmstrip advances to that point where the ball went



into the rough. The microcomputer than "flips a coin" based on 70/30 odds that you'll be able to find your ball. You then must play the ball out of the rough. If it went out of bounds, the drop area is shown and the required number of strokes are added to the score.

Sand traps operate in much the same manner as the rough. The filmstrip advances until the player sees the view from the trap. However, the ball has to be played out of an indentation in the floor in which deep-shag carpet has been layed. When the player reaches the green, the projector turns off and overhead lights illuminate the contoured putting surface. The dips and rises more accurately simulate a real green.

Once the microcomputer has calculated the distance the ball is from the pin, it selects the closest series of putting positions. A random number generator then indicates from which of the 20 putting spots you will hole-out. Once putting is complete, the player keys in his putting score on the touch panel at the control unit. The score for the hole is then displayed and also stored in memory for the next hole.

The game is, indeed, a true simulation. When a golfer totally unfamiliar with the system steps up the first tee, the immediate sensation might well be that the ball is being hit into a screen. But this is soon forgotten when the player realizes that accuracy depends on the correct reading of the pictures and proper aiming down the middle of the fairway. The game leaves little to the imagination and nothing to chance. Virtually every contingency has been programmed in.

Mike Milaska, a local pro in Salt Lake City, has played both Pebble Beach and Par-T-Golf. "When I first played Par-T-Golf, I could not break par," said Milaska. "But once I realized that I had to play the game the same way I play the course, my score has come down." Playing the game recently on NBC's Today Show, Mike commented, "It is really a great concept. You use the same clubs, see the same sights, face the same challenges."

Par-T-Golf was originally designed using an 8-bit microprocessor system. However, according to Bob Wilson, President of Optronics, Ltd., the 8-bit system simply did not offer the computing power required for a true simulation of the game of golf. His goal was to develop an indoor game that would give a golfer all of the challenges and rewards of actual playing the course being shown on the screen.

"In order for a game like this to be truly worthwhile," said Wilson, "the golfer has to believe he is really there, playing a real game, with all of the local rules

and golf etiquette. The TMS9900 has given us the chance to develop just such a system. Up to four players will follow all of the local rules, courtesies and special features of Pebble Beach, or Spy Glass or whatever course the group selects to play."

"We'll be able to add a variety of courses and all of their intricacies; even wind factors to suit the skills of particular players," added Wilson. "For example, you may want to play Pebble Beach in a 20 mile-per-hour wind where you need a driver to get off the 7th tee onto the green. And that's only 110 yards."

Wilson looks forward to the

day when Par-T-Golf systems are established in the United States and Canada, installed in much the same manner as bowling alleys. One customer in Salt Lake City has ordered ten units to be installed in a building currently undergoing renovation.

"The operator, programming any one of the machines from the front desk, could send a foursome down to Machine #9, and have the course selected and conditions programmed in by the time they have their shoes changed," stated Wilson. "When the game is over, the operator can have handicaps computed before they get back to the desk to

pay the bill."

The revolution in electronic toys and games has progressed from the simple 4-bit devices through the 8-bit machines and now is making inroads into 16-bit technology. Maybe next year, a golfer need not fight the snow and cold to play his favorite course. He simply drives down to his nearby Par-T-Golf parlor and enjoys the likes of Pebble Beach, Sun Valley, Augusta or maybe even St. Andrews.

For more information on Par-T-Golf, contact B.F. Wilson, Optronics, Ltd., 2125 South 400 West, Salt Lake City, Utah 84115; (801) 486-5407.

A Vision of the Future

English textile workers of the early 1800s found themselves losing jobs to weaving machines created by the Industrial Revolution. They took the name "Luddites" and formed bands to smash the machinery and preserve the status quo. While the Luddites achieved some small victories, the thrust of their efforts — to thwart the Industrial Revolution — was doomed to failure.

There are Luddites among us today, observed Ben Bova, science fiction editor of *Omni* magazine. Speaking at the National Computer Conference, Bova said that these neo-Luddites, who fear and hate computers, may win where their earlier counterparts lost. And if the Luddites succeed in halting the Computer Revolution, they may plunge us into another dark age — or worse.

But what if the Luddites don't win? In that case, computers will continue to become more and more important in our lives. With a science fiction writer's vision, Bova speculated on the future of computing.

Personal computers, he said, will "bring back the butlers and maids of days gone by." The computers will be our servants, always ready to do our bidding.

Further, computers may re-

place many civil servants. Many bureaucratic jobs could be just as easily handled by computers — and the computers would be easier to deal with than the bureaucrats, Bova believes.

Computers will revolutionize publishing. A publisher's biggest cost comes from "schlepping paper around the country," Bova said. "If you could move electrons instead of paper, books would cost a nickel each."

With better, computer-assisted communications, people will work at home instead of commuting to the office each day, Bova said.

In his novel *Colony*, Bova created a hero with a direct wire-to-nerve hookup that permitted him direct access to any nearby computer. Since computers were ubiquitous, this hero had vast amounts of knowledge and information instantly on tap. But when the hero found himself in an isolated, undeveloped spot on earth, such as the middle of Brazil, he felt lost and alone. He was cut off from the computers.

Bova believes such wire-to-nerve hookups will be not only possible, but commonplace. Future generations will think it quaint we didn't have direct access to information, he said.

With computers becoming so common, will they be used to dominate us? Bova thinks not, and drew a parallel with the development of gunpowder to illustrate his point.

Gunpowder was first used by the barons and nobles to control the population. This technology helped turn the barons into kings and gave rise to kingdoms. Only the nobles had gunpowder, and they kept it for themselves.

But soon the technology trickled down to the masses, so that even poor farmers could have guns. It was an armed population that permitted the American Revolution and allowed revolutions in other countries to overthrow the power of the kings and nobles. Once the people had access to the technology, the governments couldn't use that technology to control them anymore.

Today, most computers are used by governments and large organizations, where they *do* help to control and dominate us. But computer technology is trickling down to the people. Computers in the hands of the people will prevent government control by computer, just as guns in the hands of farmers prevented domination by kings and nobles.

Personal computing pioneers are essential to future freedom, Bova said.

—Don Wood

In Other Words

Touring Europe with only English to get you by isn't easy. And learning another language can be difficult; but with the language translators now available, "speaking" a foreign language is as easy as using a calculator.

Texas Instruments and Craig Corporation both offer pocket translators. One allows for both display and vocal output; the other provides display only. Operating the devices merely requires a spelling capability for punching in the desired word. For instance, if you'd like to say "Hello" in French, you'd key in H-E-L-L-O and the French version, BONJOUR, would appear on the display.

The Language Translator from Texas Instruments, retailing for \$250, uses a speech synthesizer to provide oral translations of common words or phrases. Along with basic phrases, vocabulary categories include common adjectives (cold, dark, expensive or small), foods; mail terms; travel terms; and time, numbers and dates.

Examples of the preprogrammed phrases are: "I need a doctor"; "I am lost"; "Can you show me?"; "I am hungry." Partial phrases are also available: "Do you have _____?"; "How much is _____?"; "I have lost _____."

Several modes offer the user further aid in communicating. One thousand words in the translate mode are translated from input language to output language (e.g., English to German or German to English). Phrases are accessed by keying in a numerical code. The memory learn mode drills the user on pronunciation and translation of the selected words. A programmed drill, the learn mode, also helps the user to learn. Voices with the most generally accepted accents were used.

Each language module, priced at \$25, contains about 1000 words. Half of these words can

be both spoken and displayed on the panel, the other half displayed only.

English and Spanish versions of the translator will be available in September, according to TI, with French, German, Chinese and Japanese offered later in the year and in 1980. TI expects department stores to act as the major outlet for the translator.

Craig Corporation's M-100 Translator offers panel display for translation of words stored on three capsules, each capsule containing about 1200 words. This translator operates much like TI's machine. Word translations are punched in and phrases are keyed in numerically. Complete and partial phrases are available.

Four reinforcement systems help the Translator also serve as a teaching aid, said the company. With "Frequency", you sort out words by their frequency of use in conversation. Each word is flashed on the screen and you repeat the correct translation.

"Spelling" tests your foreign word spelling capabilities. You key in the foreign version of an English word flashed on the screen and the unit either corrects your answer or tells you you're right. "Category" lets you learn by sub-

ject. For instance, you can access alphabetically all the words associated with a trip you're taking. You can brief yourself on all the words you'll be using most. "Alphabet" simply displays all the words beginning with a particular letter.

The Translator will also question you on misspelled words and double meanings. You press the appropriate key and all the possible spellings or words will appear on the panel.

A memory capsule will store other data for you, allowing access to other learning programs, statistics, recipes and so forth.

Craig's Translator, available in department stores, is priced at \$199.95. For more information contact Craig Corporation, 921 West Artesia Blvd., Compton, CA 90220; (213) 537-1233. For more information on TI's translator contact Texas Instruments, Consumer Relations, P. O. Box 53, Lubbock, TX 79408.

Language translators can come in handy when it's time to order lunch in Paris, ask directions in Madrid or read road signs in Munich. Or, you can use one to learn the language before your trip, ensuring smooth travelling.

—Marjorie Morse

Of Mice and Maze

Finals of the Amazing Micro-Maze Contest, sponsored jointly by *Spectrum* and *Computer* magazines at NCC 79, was the culmination of four preceding test runs held at various computer shows throughout the country during the past year. These previous runs were mostly experimental. They gave participants a chance to test their electronic creations and make desired changes in construction.

The unique contest was originated in January 1978 by Donald Christiansen, editor of *Spectrum*, published by IEEE. Roger Allan, associate editor of the same publication, served as master of ceremonies and

directed the contests. Detailed stories of the contest, written by Allan, are scheduled to appear in August's *The Institute* and September's *Spectrum*, sister publications.

The NCC, someone said, was almost like a Barnum and Bailey circus, only instead of high-wire artists and lion acts they show off computers which do fancy tricks more amazing than a tiger's leap through a hoop of fire.

Although the big show was taking place at the main tent of the Coliseum, there were plenty of side shows elsewhere. The mouse-in-the-maze contest was underway at the Sheraton. More than 300 spectators crowded themselves into the room,

RANDOM ACCESS

forming a solid human ring around the maze course. Some spectators stood on boxes, some on chairs and some on other spectators.

By standing at the very tip of a folding chair you could glimpse the starting chute of the maze course. Halfway up the chute was a "T" opening and the mice all entered it to explore its geography, record the coordinates in RAM memory, then emerge to continue their journey.

Each mouse made three runs through the maze. Rationale behind the required three runs was that it would give the electronic creations an opportunity to demonstrate the learning process. The first runs would deliver a geographical knowledge base to the memory. The second run would calibrate time, distances and correct course selection and would evaluate all the input. The third run would give the mouse a chance to demonstrate its tree-searching and computing power. On the third run each mouse should theoretically make a mad dash from the starting line to the finish without going down "U" turns or dead-end roads.

Specifications had been announced last year by Christiansen and Allen's committee. Dimensions of the maze were to be no larger than 20' by 20' and the course would consist of combinations of straight chutes, elbows, "U" turns, "T" joints and dead ends. The electronic mice, too, had their own specifications: 10" wide by 10" long with no limit on height. Laws of stability, it was assumed, would put limits on how high one could raise the center of gravity. Batteries, electric motors and mechanical springs were to be the only legal sources of locomotion. The mouse had to be a self-contained functioning unit with no hard wiring, and no remote communication. It was to be constructed from a free starter-bag of assorted components (microprocessors, memories, I/O ports, rechargeable batteries, etc.). Con-

testants were not required to use these starter-bag components; however, they had to comply with the basic restrictions.

Sixteen entrants registered for the contest, the winner of the \$1000 first prize (fastest run through the maze) was "Moonlight Flash", built by Art Bolan, Ron Dilbeck and Phil Stover of Batelle Northwest Research in Richland, Washington. That Batelle Co.'s research team also entered another model, "Moonlight Express", which won second prize (an oscilloscope)

tywampus", won for them a Panasonic slide-rule calculator donated by Chafitz, Inc. "Mushka" successfully got through the maze on its third trial and won a National Semiconductor Digital Chronograph Watch for its two designers, John Ditner and Bob Norton both of Ontario. The only other entry to solve the maze was "Dudley". It was designed and built by David Schefer and Roger Sanderson, also from Ontario.

Other participants in the race who failed to finish were



The "Amazing Micro-Mouse Maze" Contest about to get underway at the Hilton during NCC '79. Contest manager Roger Allan (mike in hand) is about to announce entrants and get things going. Winner of the contest was the team of Art Bolan, Ron Dilbeck and Phil Stover, at far right. William Saunders, Assistant Publisher of Spectrum, (in glasses) is studying the electronic timer, getting it ready for the upcoming race. Winner of the race was "Moonlight Flash" sitting in the maze directly in front of Bill Saunders.

for being the "fastest learning mouse".

"Harvey Walbanger" was runner up to "Moonlight Flash" and, as a result, won third prize (an Atari system). "Harvey" was designed and built by Gary Gordon, Gary Sasaki and Ken McLeon, all with Hewlett-Packard, Santa Clara, CA. The prize for most original-looking mouse went to Howard Katseff of Bell Labs, Holmdel, NJ, and Michael Sipser of University of California, Berkeley. Their entry "Cat-

"Mickey and Mini" by Michael and Anelle Riggsby of Norcross, GA, "Theseus" by David Siffer, Scott Pector and Robert Matz of Illinois; "Charlotte" by Earl Kalbfleisch of Rochester, NY; "Mazey" by Tony Rossetti and Peter Rowe of Sunnyvale, CA, and Steve Allen of Carlsbad, CA; "Kimbot" by Mark Kantrowitz of Rockaway, NJ; "Wumpus II" by David Block of Albany, CA, and "Microbot" by James Hamblen of Atlanta.

—Harry Shershow

☆☆☆ Announcements ☆☆☆

The Northeast Personal and Business Computer Show at Hynes Auditorium, Prudential Center, Boston, MA, will be held Friday, September 28 through Sunday, September 30, 1979. Show hours are: Friday and Saturday, 12 noon to 10 p.m.; Sunday 12 noon to 6 p.m. General adult admission (including seminars and lectures) is \$5. For more information contact Northeast Exposition, P.O. Box 678, Brookline Village, MA 02147; (617) 522-4467.

The Fourth Annual Tidewater Hamfest-Computer Show-Flea Market will be held in the Norfolk, VA, Cultural and Conventional Center October 20 and 21, 1979. 60,000 square feet of air-conditioned exhibit and Flea Market tailgating space are available. Doors open at 9:00 AM. ARRL meetings, DX, Traffic forums, plus a CW contest are scheduled. FCC Exams are planned for amateur upgrading on Saturday, 9 to 12 a.m. A special feature will be a dinner cruise and banquet on the Spirit of Norfolk Cruiseship Saturday night. Prices: Advance registration \$2.50 (SASE), \$3.50 at the door; Flea Market tailgate \$3 day; Cruise and banquet \$16 per person, \$30 couple. For tickets and information contact TRC, P.O. Box 7101, Portsmouth, VA 23707.

Honolulu, Hawaii, now has its own Apple Computer Users Group. H.A.U.S., Honolulu Apple Users Society, supports a newsletter containing information on the Apple including program tips and techniques, listings and reviews.

Meetings are held the first Monday of each month at the Computerland Store in Honolulu. President Bob McDowell and vice president Randy Brumback hold weekly sessions on programming, learning BASIC, exchanging

information, Hi-Res Graphics, and so forth. The annual dues of \$10 include the newsletter.

The club is interested in exchanging information and software with other clubs. Contact Bill Mark, 98-1451-A Kaahumanu St., Aiea, Hawaii 96701; (808) 488-2026.

The Personal Computing Festival of NCC'80 will be held at the Disneyland Hotel Convention Center in Anaheim, CA, May 19 to 22. A call for participation has gone out to all microcomputerists. If you'd like to present a paper, give a talk, deliver a tutorial, volunteer to be a panelist, organize a panel session or demonstrate your own application and equipment, contact officials now.

If you are a potential participant, send a letter describing your intended contribution no later than February 1, 1980, addressed to: Program Chairman, NCC '80, Personal Computing Festival, c/o AFIPS, 1815 N. Lynn Street, Arlington, VA 2220 22209. An abstract or description and a brief biography should be included. For more information contact NCC '80 Personal Computing Festival, c/o AFIPS, 210 Summit Ave., Montvale, NJ 07645.

The 4th Annual California Computer Swap Meet will be held on September 15th, from 9 a.m. to 5 p.m., at the San Mateo County Fairgrounds, just south of San Francisco on Hwy 101. Personal computing hardware and software will be sold by individuals, manufacturers and stores from the entire West Coast. Admission is free to buyers (with the exception of a \$1 Fairgrounds parking fee) and sellers, both individuals and companies.

Call John Craig, editor of *Creative Computing*, at (805)

735-1023 for booth prices and availability (or write to: RFD Box 100 D, Lompoc, CA 93436).

The 1980 International *Summer* Consumer Electronics Show will be held in Chicago, Sunday, June 15 through Wednesday, June 18. Long-range plans call for the Summer Show to be held each year in Chicago in June.

The 1980 International *Winter* Consumer Electronics Show, to be held Saturday, January 5 through Tuesday, January 8, in Las Vegas, has received over 550 applications for space, according to officials. The show is expected to attract over 800 exhibitors utilizing over 450,000 net square feet at the Las Vegas Convention Center, the Jockey Club Hotel and the Las Vegas Hilton.

For information on both shows contact William Glasgow, Show Manager, Consumer Electronics Shows, Two Illinois Center — Suite 1607, 233 N. Michigan, Chicago, IL 60601; (312) 861-1040.

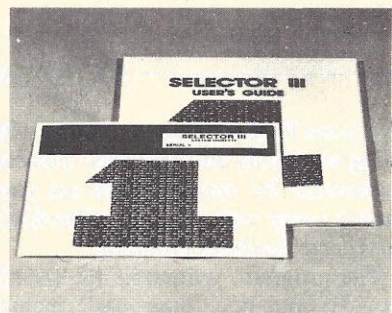
Both beginners and experts will find articles on machine language programming, hardware modifications and other computer languages in *insiders: the TRS-80 hardware journal with machine software*.

Regular features include a column on printers; the Disc File, covering the latest in DOS and compatible drives; a Dear Aunt TRiSh question and answer column; and Learning Machine Language with Level II.

A section will cover several of the new TRS-80 languages. Future issues will include features on Fortran, Forth, other languages, CP/M and reviews of commercially available program.

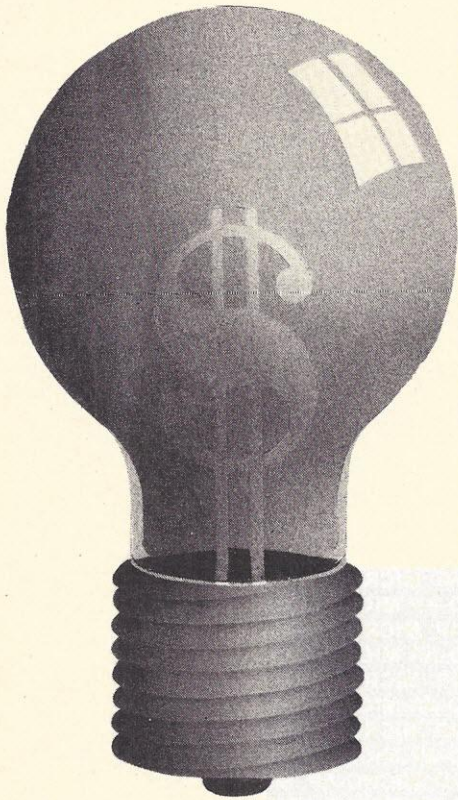
An *insiders* subscription costs \$7.50 for six issues. Contact Computer Cablevision; 2617 42nd St. NW, Suite 2N, Washington, DC 20007.

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SEPTEMBER 1979 Personal Computing 17

Electric Usage Analysis Program



Plagued by
rising utility
costs?
This program
analyzes
electricity, gas
and water use
to help you
save money.

—BY HOWARD BERENBON—

Everyone feels the energy crunch, with rising electricity and gas costs. You can economize by cutting down on your energy usage with the help of the Electric Usage Analysis Program.

The program, written in 4K BASIC, requests entry of a "base year", including 12 months of electric usage, in units, beginning with January. This data is compared with a "recent year" entry, also 12 months of usage in the same units. By indicating the difference in electric usage from the base to the recent year, the program acts as an incentive to reduce your usage in the areas where it's increased; you may be convinced to turn off unnecessary lights and appliances or even lower your thermostat in the winter and use less air conditioning in the summer. A cut in usage could mean a cut in bills.

After the program requests the entries, it prints the "base year" electric usage data with the average units used per month, total units used, units used per month and the percentage of total units used per month. Then it prints the "recent year" electric usage data with the average units used per month, total

units used, total difference between the two years (recent minus base), units used per month and the percentage of total units used per month. Finally, the program prints the difference per month between the two years.

A positive value for this calculation indicates an increase in electric usage from the same month in the "base year", and a negative number indicates a decrease in electric usage from the same month in the base year. You can determine which months need special attention, and watch those lights and appliances closer. Units add up.

The program will run in most 4K BASICs without modification. If you own a TRS-80 Level I, eliminate line 0010 DIM A(100). Level I BASIC does not recognize the DIM statement.

You can also analyze other utilities with this program. In the case of gas usage, just substitute units of gas usage for units of electric usage. If you increased usage (without the addition of other factors, like extremely cold winters), you may want to check your windows for air leaks and your insulation for deterioration.

Water usage may be analyzed in the same way. If you see a large increase in total usage compared to the base year, check your water pipes for possible leakage.

Give the Electric Usage Analysis Program a try. The utilities you analyze may be taking more money than they deserve. □

Howard Berenbon operates a mail-order software business. His product line includes a TRS-80 telephone dialer (\$7.95 for Level I cassette plus instructions.) Write to Software Exchange, 2681 Peterboro, W. Bloomfield, MI 48033.

Program Listing

```

0010 DIM A(100)
0100 PRINT "ELECTRIC USAGE ANALYSIS PROGRAM"
0110 PRINT
0120 PRINT "COPYRIGHT (C) 1979 BY HOWARD BERENBON"
0130 PRINT
0140 PRINT "ENTER BASE YEAR"
0150 INPUT P
0170 PRINT "ENTER UNITS OF ELECTRIC USE"
0180 PRINT "FOR EACH MONTH OF ";P
0190 N=1
0200 GOSUB 890
0300 PRINT "ENTER RECENT YEAR"
0310 INPUT T
0320 PRINT "ENTER UNITS OF ELECTRIC USE"
0330 PRINT "FOR EACH MONTH OF ";T
0340 N=13
0360 GOSUB 890
0390 A=A(1)+A(2)+A(3)+A(4)+A(5)+A(6)+A(7)+A(8)+A(9)+A(10)+A(11)+A(12)
0400 B=A(13)+A(14)+A(15)+A(16)+A(17)+A(18)
0410 C=A(19)+A(20)+A(21)+A(22)+A(23)+A(24)
0415 D=B+C
0420 PRINT "BASE YEAR ";P,"AU/MO= ";A/12
0430 PRINT "TOTAL UNITS USED= ";A
0450 PRINT "MONTH      UNITS      %TOTAL"
0460 PRINT "JAN      ";A(1);"      ";A(1)/A*100
0470 PRINT "FEB      ";A(2);"      ";A(2)/A*100
0480 PRINT "MAR      ";A(3);"      ";A(3)/A*100
0490 PRINT "APR      ";A(4);"      ";A(4)/A*100
0500 PRINT "MAY      ";A(5);"      ";A(5)/A*100
0510 PRINT "JUN      ";A(6);"      ";A(6)/A*100
0520 PRINT "JUL      ";A(7);"      ";A(7)/A*100
0530 PRINT "AUG      ";A(8);"      ";A(8)/A*100
0540 PRINT "SEP      ";A(9);"      ";A(9)/A*100
0550 PRINT "OCT      ";A(10);"     ";A(10)/A*100
0560 PRINT "NOV      ";A(11);"     ";A(11)/A*100
0570 PRINT "DEC      ";A(12);"     ";A(12)/A*100
0580 PRINT "TO CONTINUE, ENTER A 1"
0590 INPUT J
0595 IF J=0 GOTO 580
0600 PRINT "RECENT YEAR ";T,"AU/MO= ";D/12
0620 PRINT "TOTAL UNITS USED= ";D;" TOT. DIFF ";T;"-";P;"=";D-A
0630 PRINT "MONTH      UNITS      %TOT.  + INCREASE, - DECR (BASE)"
0640 PRINT "JAN      ";A(13);"      ";A(13)/D*100;"      ";A(13)-A(1)
0650 PRINT "FEB      ";A(14);"      ";A(14)/D*100;"      ";A(14)-A(2)
0660 PRINT "MAR      ";A(15);"      ";A(15)/D*100;"      ";A(15)-A(3)
0670 PRINT "APR      ";A(16);"      ";A(16)/D*100;"      ";A(16)-A(4)
0680 PRINT "MAY      ";A(17);"      ";A(17)/D*100;"      ";A(17)-A(5)
0690 PRINT "JUN      ";A(18);"      ";A(18)/D*100;"      ";A(18)-A(6)
0700 PRINT "JUL      ";A(19);"      ";A(19)/D*100;"      ";A(19)-A(7)
0710 PRINT "AUG      ";A(20);"      ";A(20)/D*100;"      ";A(20)-A(8)
0720 PRINT "SEP      ";A(21);"      ";A(21)/D*100;"      ";A(21)-A(9)
0730 PRINT "OCT      ";A(22);"      ";A(22)/D*100;"      ";A(22)-A(10)
0740 PRINT "NOV      ";A(23);"      ";A(23)/D*100;"      ";A(23)-A(11)
0750 PRINT "DEC      ";A(24);"      ";A(24)/D*100;"      ";A(24)-A(12)
0760 END
0890 PRINT "JAN"
0900 INPUT A(N)
0910 PRINT "FEB"
0920 INPUT A(N+1)
0930 PRINT "MAR"
0940 INPUT A(N+2)

```


Sample Run

Program

Listing continued

```

0950 PRINT "APR"
0960 INPUT A(N+3)
0970 PRINT "MAY"
0980 INPUT A(N+4)
0990 PRINT "JUN"
1000 INPUT A(N+5)
1010 PRINT "JUL"
1020 INPUT A(N+6)
1030 PRINT "AUG"
1040 INPUT A(N+7)
1050 PRINT "SEP"
1060 INPUT A(N+8)
1070 PRINT "OCT"
1080 INPUT A(N+9)
1090 PRINT "NOV"
1100 INPUT A(N+10)
1110 PRINT "DEC"
1120 INPUT A(N+11)
1130 RETURN
    
```

```

BASE YEAR 1976  AV/MO= 465.166666
TOTAL UNITS USED= 5582
MONTH  UNITS  %TOTAL
JAN     460    8.24077391
FEB     480    8.59906843
MAR     432    7.73916159
APR     395    7.07631673
MAY     385    6.89716947
JUN     325    5.82228591
JUL     390    6.9867431
AUG     550    9.85309924
SEP     460    8.24077391
OCT     465    8.33034754
NOV     595   10.6592619
DEC     645   11.5549982
    
```

```

RECENT YEAR 1978  AV/MO= 559.5
TOTAL UNITS USED= 6714  TOT. DIFF 1978 -1976 =1132
    
```

MONTH	UNITS	%TOT.	+ INCREASE, - DECR (BASE)
JAN	650	9.68126303	190
FEB	692	10.3068215	212
MAR	560	8.34078045	128
APR	435	6.4789991	40
MAY	389	5.79386356	4
JUN	333	4.95978552	8
JUL	502	7.47691391	112
AUG	745	11.0962168	195
SEP	610	9.08549299	150
OCT	453	6.74709562	-12
NOV	495	7.37265415	-100
DEC	850	12.6601131	205

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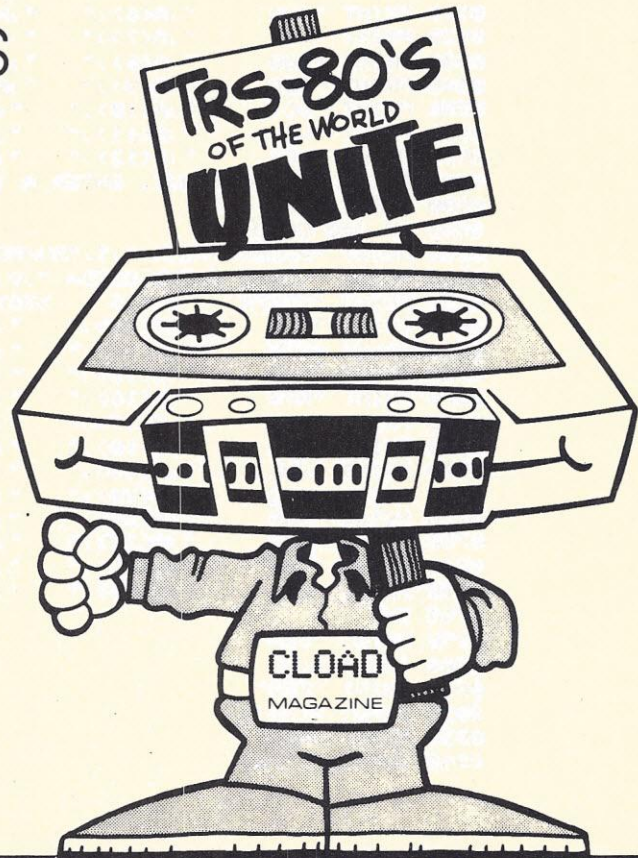
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CIRCLE 10

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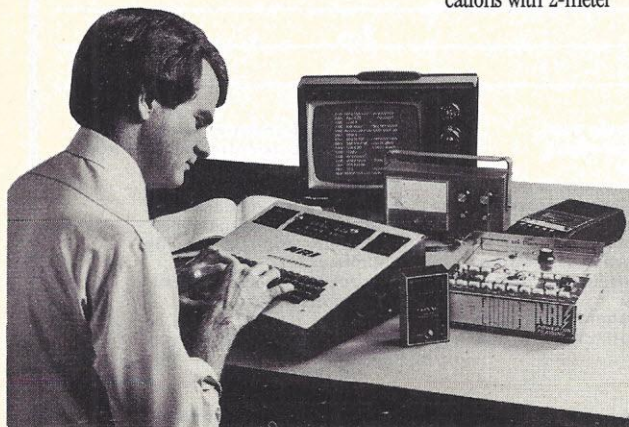
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How to write for Personal Computing

You've written the programs we want to publish. You — the *Personal Computing* readers — are using your computers in businesses, homes, offices and schools. Other readers, just as software-hungry as you, are eager to try out your programs, your applications and your techniques. So why not share what you've done by submitting an article to *PC*?

It's easier than you might think. Remember: we're more interested in practical programs and useful applications than in fancy prose. And our editorial staff stands ready to help with any problems you encounter in writing your article; just give us a call at (617) 232-5470.

Here are some handy guidelines to help you get started.

First, decide what kind of article you want to write. Do you have a *business program* that will help an executive, salesman, doctor, lawyer or shopkeeper function more efficiently? Think about how businesses can benefit from microcomputers — not only in the obvious areas of inventory, accounting and payroll, but in all departments and levels right up to the president's desk. Financial and marketing analysis, time management, planning, material handling, product design and cost accounting are areas ripe for creative programming.

How do you use your computer for *home and personal applications* in your living room, kitchen, study or den? Again, think beyond the obvious areas of checkbook balancing and budgeting (though these areas are far from exhausted) to other applications. Hobbies, home management, household inventory, gardening and landscaping, personal income and expense analysis, personal mailing lists and word processing are just a few ideas to spark your imagination.

What *education programs* have you written for children, adults, professionals, businessmen and teachers? Computers can not only teach children basic subjects such as spelling, math, geography, economics, civics, grammar, literature and science, but can help adults review or sharpen skills in these areas as well. How else can computers function in or out of the classroom to aid learning? To help teachers and administrators?

Are you proficient in some programming technique or special computer area you could explain in

a *tutorial article*? How do you save time, money, computer memory or frustration when programming or using your computer? Others can benefit from the same techniques you use.

Computer games, history, humor and fiction are other areas rich in article and story ideas.

Your second step is to write the text of the article. Remember, readers aren't familiar with your program. So explain in detail what the program does and how it does it. Include here the overall structure of your program as well as any special algorithms or routines you've used. Give suggestions for modifying or expanding the program for other applications, other businesses or other situations.

Third, prepare your supporting documentation. Include at least a program listing and one or two sample runs, and add program notes to explain any special commands used or other special features of your program. Use charts, diagrams, figures and photos if they help explain your program and its use.

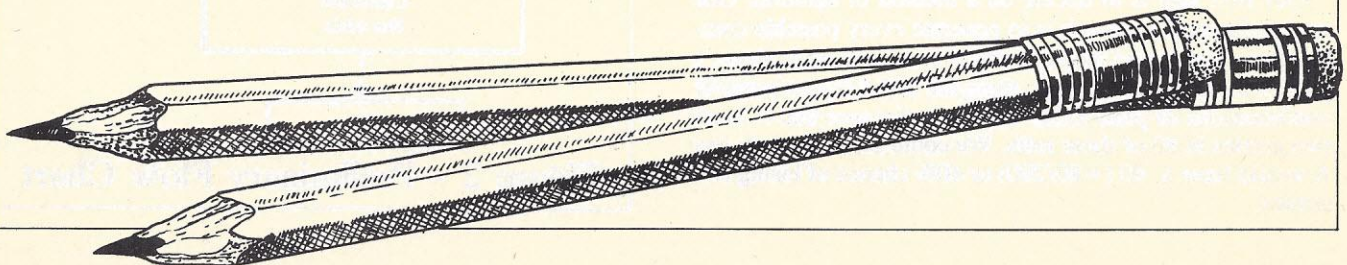
Finally, mail your manuscript. Address it to Editor, *Personal Computing Magazine*, 1050 Commonwealth Ave., Boston, MA 02215.

A few suggestions: All submissions should be original, typed (*not* all CAPS), double-spaced and neat. Please include your name and address on the first page of the article and enclose a self-addressed, stamped envelope for return of material.

Since we photograph program listings and sample runs exactly as you send them to us for publication in the magazine, please be sure you use a fresh ribbon for computer printouts. If you don't have a printer, you can type your listings single spaced; but again, be sure you use a new ribbon. (If your program relies heavily on graphics, you can photograph sample runs from your CRT. But take care to avoid distortion due to the curve of the screen.)

Feel free to call us if you have any questions or want to discuss specific ideas. We can give you feedback and suggest appropriate slants and approaches.

We're always looking for fresh, original ideas. While these guidelines will help you in preparing material for *Personal Computing*, don't assume we don't want your idea just because it's not mentioned here. Let us and our readers know what *you're* doing with your computer.



How to Program a Complex Problem

BY BRUCE D. BARNETT

Can you write a complex program for your computer? This article takes you through a step-by-step account of my attempt to write a program, including my failures and eventual success.

Consider the problem of computing the odds of winning a single battle in the war game Risk. The scheme which uses dice to determine winners is at once both clever and simple. Briefly, one player (called A for attacker) has a choice of rolling one, two or three dice. The defender (D) can respond with one or two dice. Let's consider just one situation, the usual case, in which A rolls three dice and D responds by rolling two. The winner of a battle is determined as follows: First A's highest number is compared to the highest number die rolled by D. Then A's second highest number is compared with D's remaining die. In any comparison, D loses an army if A's number is higher. If D has a higher number or ties A, then A loses an army instead. Thus either A or D may lose two armies or each may lose one depending on the results of each comparison.

As an example, suppose A rolls 6, 5 and 2, while D rolls 6 and 4. The two 6s are compared first. Since this result is a tie, A loses an army. Next A's 5 is compared with D's 4. Since A beat D's number in this comparison, D loses an army also. Figure 1 gives results for some other rolls. Clearly, the higher the roll the better one's chances of winning.

Attacker (A) Rolls	Defender (D) Rolls	Outcome
6, 3, 2	5, 1	D Loses 2
5, 5, 5	5, 5	A Loses 2
3, 3, 2	6, 1	Each Lose 1

Figure 1 - Sample Rolls

Now let's see who has the advantage and by how much. Note that A rolls three dice and D two, so A has a better chance of rolling two high numbers. But D wins ties. At this point, try guessing who has the better chance of winning. The program we'll develop will find out.

Our first step is to decide on a method of solution. One straightforward approach is to generate every possible combination of rolls and then determine and count each player's gain or loss. If, for example, there are 200 different possible combinations of joint rolls, we might discover that A loses two armies in 80 of these rolls. We could then conclude that A would have a .40 ($=80/200$) or 40% chance of losing two armies.

Having a method of generating and comparing all combinations in mind, we next construct a rough flow chart — a diagram showing how the computation might proceed. I heartily recommend that anyone who wants to wire programs do this important step. Besides clarifying your thinking, a flow chart is also a first step toward sound documentation. My first attempt produced Figure 2. I've arbitrarily decided to first select an attacker's combination and then run through all of D's possible combinations. Of course, we can change the flow chart as we get further into the problem.

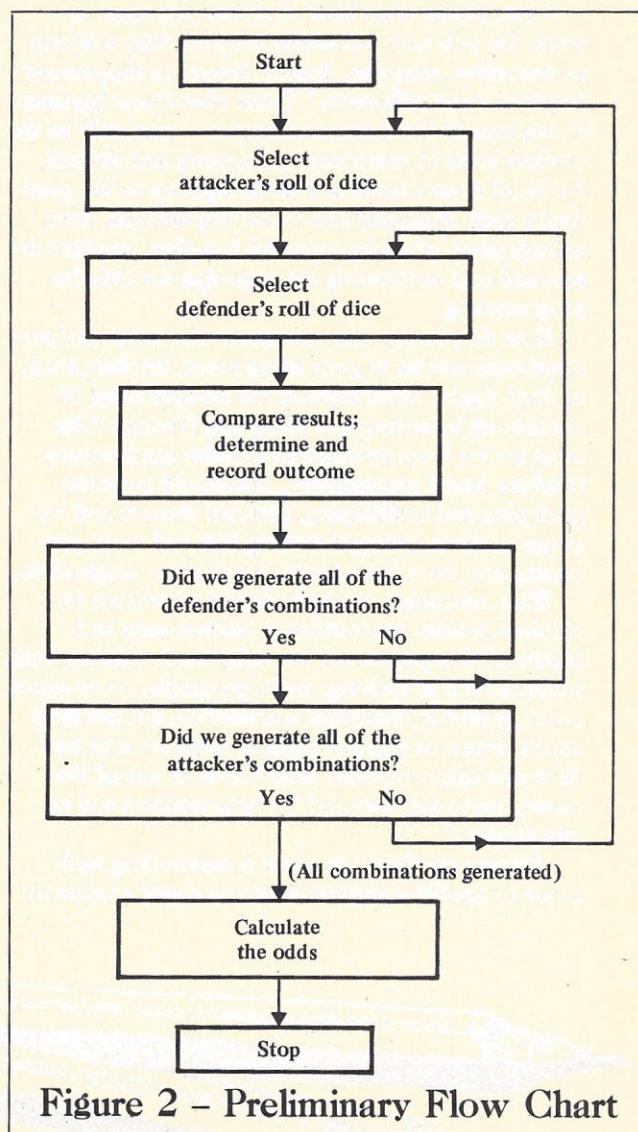


Figure 2 - Preliminary Flow Chart

Now we expand the logic of each block. Let's consider A's roll of three dice first and hope that D's roll of two dice will simply fall out as a special case. At this point, we choose names for the variables to contain the results of A's roll. Since we are going to look at each of A's dice separately, let's call our three variables R1, R2 and R3.

One way that comes to mind to create all of A's combinations is to start with the highest numbers and work down in sequence: 6,6,6; 6,6,5; . . . ; 6,6,1; 5,6,6; 5,6,5; . . . ; 1,1,1. Here the three dots simply denote that not all terms of the complete series were written out. Incidentally, we could just as easily have started at the lowest combination and worked up.

There are several ways to generate these combinations. One way is to work in base 7; another is to appropriately subtract 1 from the proper variables so as to work our way from 6,6,6 to 1,1,1. We'll take this latter approach. Again, I find a flow chart extremely helpful. Figure 3 shows the flow chart I finally arrived at. In preparing it, I used an eraser a number of times.

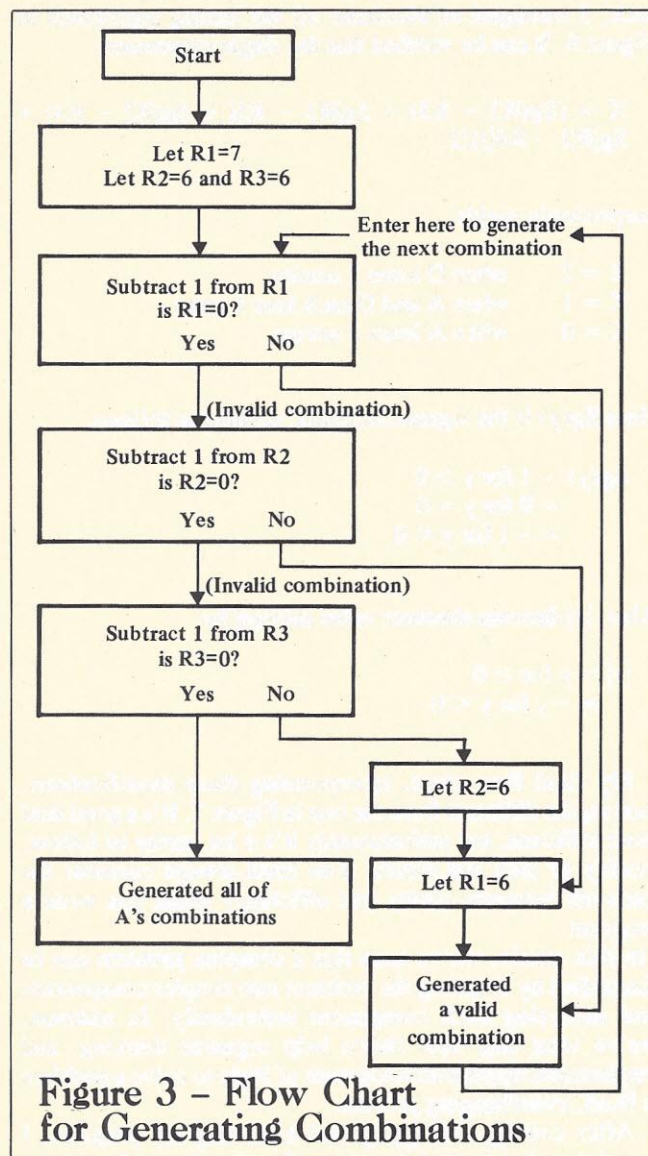


Figure 3 – Flow Chart for Generating Combinations

I notice that if I initially let R1 = 7, I won't have to consider any special cases first time through the logic. I also mentally ran through the logic with some specific numbers and so far it seems to do what I want. Now we can easily generate D's roll. Since I want to keep D's roll separate from A's, I decided to use the variables R5 and R4. Figure 4 shows the flow chart for D's rolls.

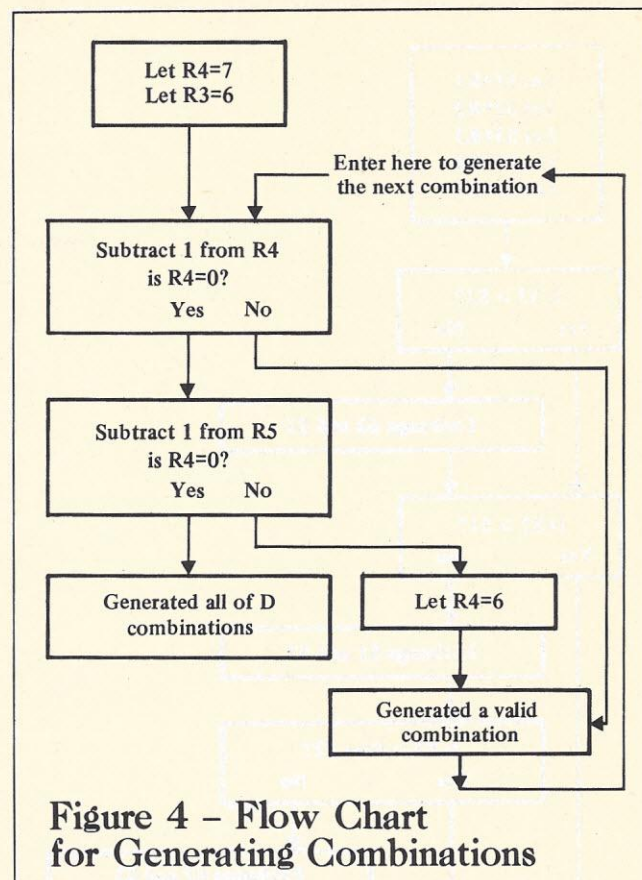


Figure 4 – Flow Chart for Generating Combinations

We're ready now to compare and record the outcome of the rolls. Another flow chart is a good way to proceed. We have to be careful to compare only each player's highest rolls according to the rules of Risk. Perhaps the easiest way to ensure the correct comparison is to first order each combination in the sequence.

Avoid the mistake of using the same variable names for the "reordered" combinations or you'll alter the intended logic in Figure 3. Use new variable names.

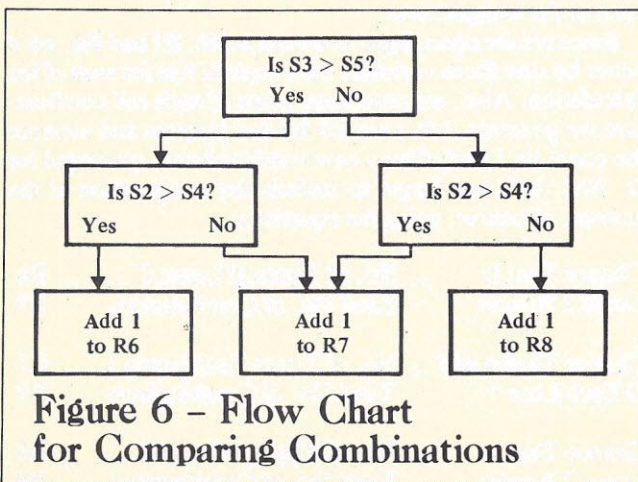
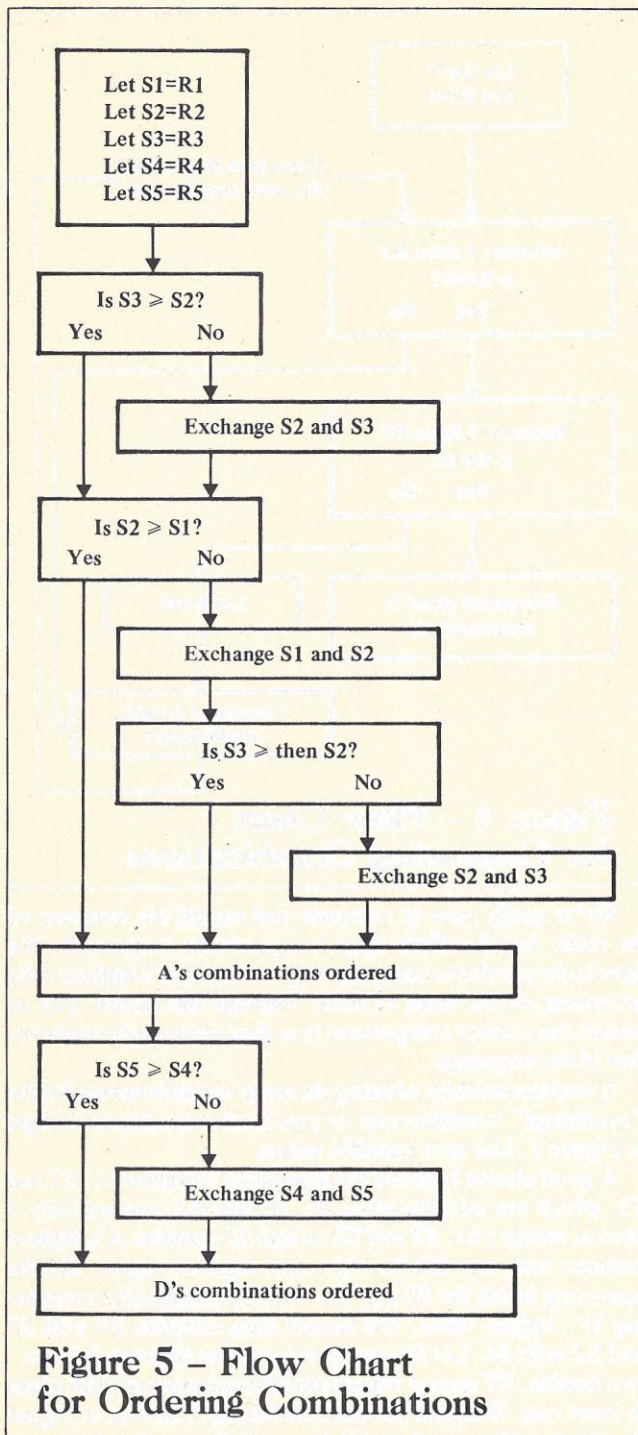
A good choice is to use the analogous variables S1, S2 and S3, which are initially set to R1, R2 and R3, respectively. I plan to reorder S1, S2 and S3 so that S3 contains A's highest number and use S2 for A's next highest value. Similar reasoning holds for S5 and S4, with S5 (arbitrarily) containing D's higher value. We should then compare S3 with S5 and S2 with S4. Let R6 record the number of times D loses two armies, R7 record when both lose one army and R8 when A loses two. Without too much difficulty, I arrived at Figure 5, which addresses the ordering, and Figure 6, which pertains to the comparisons.

Since we are summing occurrences in R6, R7 and R8, we'd better be sure these variables each contain 0 at the start of the calculation. Also, we must keep count of each roll combination we generate. Let's use R9 for that purpose and increase the count by 1 each time a new combination is generated for D. And, let's not forget to include the computation of the answer, of course, using the equations:

$$\text{Chance That D Loses 2 Armies} = \frac{\text{No. of Times D Loses 2}}{\text{Total No. of Combinations}} = \frac{R6}{R9}$$

$$\text{Chance That A and D Each Lose 1} = \frac{\text{No. of Times Each Loses 1}}{\text{Total No. of Combinations}} = \frac{R7}{R9}$$

$$\text{Chance That A Loses 2 Armies} = \frac{\text{No. of Times A Loses 2}}{\text{Total No. of Combinations}} = \frac{R8}{R9}$$



Now we combine our blocks into one big flow chart. The final result is shown in Figure 7. At this point we can easily code the program into the computer.

Right now I won't vouch for the accuracy of the logic; but I hope I have a reasonable chance of computing the correct answer. Only after running some test cases to thoroughly check out the logic, can one say that the logic is correct.

By now, well into the problem, I've gained some valuable insights that could improve the logic and shorten the program execution time. For example, I've noted that the comparisons use only A's two highest dice, so it's not necessary to repeat many identical computations that result as A's lowest die changes value. I can account for these combinations by other, more efficient means. Also, if we can initially determine the total number of comparisons involved, we'll only need to count the number of times A loses two armies and the number of times A loses one army. In all remaining comparisons, D must lose two armies. Thus we eliminate many comparisons. Further, with some trial and error and some luck, I managed to eliminate all the testing performed in Figure 6. It can be verified that the single expression:

$$X = (Sg(R3 - R5) + Sg|R3 - R5| + Sg(R2 - R4) + Sg|R2 - R4|)/2$$

surprisingly yields:

$$\begin{aligned} X &= 2 && \text{when D loses 2 armies} \\ X &= 1 && \text{when A and D each lose 1 army} \\ X &= 0 && \text{when A loses 2 armies} \end{aligned}$$

Here $Sg(y)$ is the signum function, defined as follows:

$$\begin{aligned} Sg(y) &= 1 \text{ for } y > 0 \\ &= 0 \text{ for } y = 0 \\ &= -1 \text{ for } y < 0 \end{aligned}$$

Also, $|y|$ denotes absolute value defined by:

$$\begin{aligned} |y| &= y \text{ for } y \geq 0 \\ &= -y \text{ for } y < 0 \end{aligned}$$

My final flow chart, incorporating these modifications, looks quite different from the one in Figure 7. It's a good deal more efficient; but unfortunately it's a lot harder to follow, modify or pick out errors. You must always consider the trade-off between clarity and efficiency when you write a program.

In this article, we've seen that a complex problem can be simplified by breaking the problem into simpler components and analyzing each component individually. In addition, we've seen that flow charts help organize thinking, and emphasized that the development of logic to solve a problem is fluid, everchanging process.

After coding, debugging and executing my program, I found that the attacker does have the advantage. The probability that A loses two armies is .292 while that of D losing two is .372. Thus a Risk player should try to maintain the offensive by throwing three dice as long as possible.

To play a possibly shorter game of Risk with fewer — but bloodier battles — you might consider permitting A to roll 4 dice and D 3 dice, or A to roll 5 versus 4 for D. Now what are the odds?

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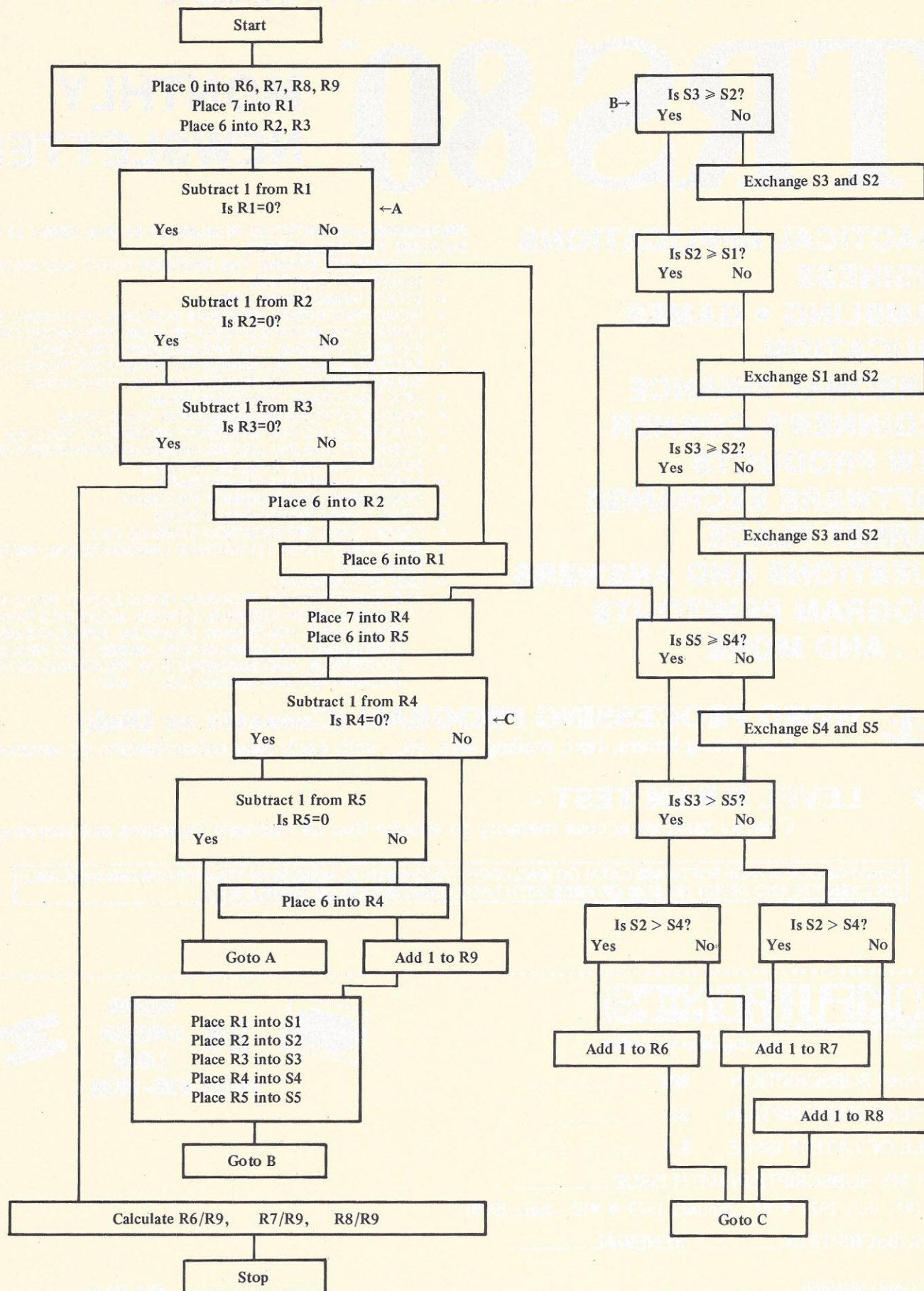


Figure 7 - Complete Flow Chart

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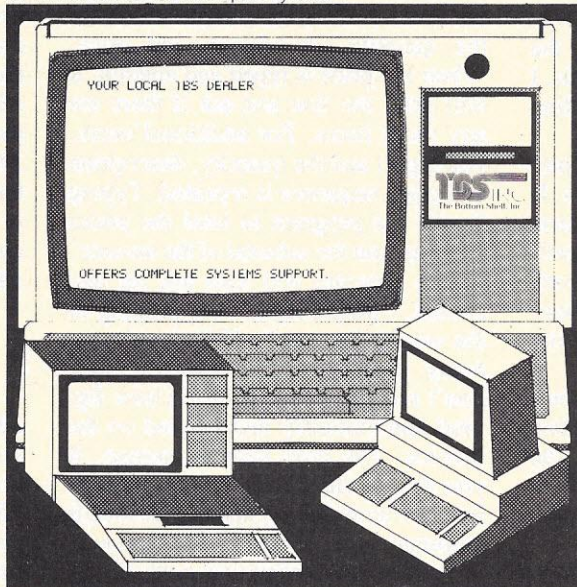
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Small Business Invoicing

BY DAN OBED

This invoicing program will work well for both the small business that needs invoicing but cannot afford the cost of computerized invoicing and for the person who has a business on the side. I wrote it for my wife, who sells wedding invitations and Tupperware.

The program can be adapted to any business that sells a quantity of items. It automatically figures the tax, subtracts any discounts, adds postage and will subtract any deposits made. The original program does not handle extensions, but I've listed the changes in the program to perform this function.

I used a TRS-80, Level II 16K computer, with an Anadex DP-8000 line printer. The interface, an American Micro Products cable, allows you to run a line printer without the expansion interface.

After you type RUN, the program prints the invoice heading, then asks for the date, name, address, city and phone

of the customer. When all items are entered it will print the information on the invoice. Then the computer asks for the quantity, description and price. When the price is typed and entered, it will print the line and ask if there are any more items. For additional items, you type 1 and the quantity, description and price sequence is repeated. Typing 2 tells the program to total the prices and print out the subtotal of the invoice.

The program will then ask for discounts. I purposely left the printing of the word "discount" off the invoice, as many customers will ask why they don't receive one. The tax is now figured automatically and entered on the invoice. The next item is postage. If you do not charge for postage, charge line 340 to meet your needs. The total is automatically printed. The computer now asks if a deposit was paid. If not, hitting the return key will print the balance due.

Lines 30 to 40 control the invoice heading. The command LPRINT CHR\$(14) extends the printing to give the larger type. On the Anadex printer, the carriage return does not automatically reset the printing to normal. Thus the LPRINT CHR\$(15) command. Line 230 controls the heading of the body of the invoice. For unit prices you'll need to modify this line. A line between 260 and 270 for the unit price will need to be added — example:

[264 input "unit price";U]

You would change line 270 to read:

[270 M=Q\$*U]

In line 280 you would also need to add a tab to print the unit price. You will have to modify line 329 to use the correct tax rate for your location. Lines 350 and 340 should also be changed if you do not charge for postage. They may be deleted if you don't have any reason to charge for postage or changed to accommodate any item needed. □

Program Listing

```
10 CLEAR 500
20 REM 'INVITATIONS BY CAROLYN
30 LPRINTCHR$(14)"INVITATIONS BY CAROLYN";LPRINTCHR$(15)
50 LPRINT"931 FOREST GREEN DRIVE, CORAOPOLIS, PA. 15108 264-0979"
60 LPRINT"=====}}====
70 LPRINTCHR$(10)
100 INPUT"DATE";D$
110 INPUT"NAME";N$
120 INPUT"ADDRESS";A$
130 INPUT"CITY";C$
140 INPUT"PHONE";P$
150 LPRINT"DATE "D$
160 LPRINT"NAME "N$
170 LPRINT"ADDRESS "A$
180 LPRINT"CITY "C$
190 LPRINT"PHONE "P$
200 LPRINTCHR$(10)
210 LPRINT"=====}}====
230 LPRINTTAB(0)"QUAN";TAB(22)"DESCRIPTION";TAB(55)"PRICE"
240 LPRINT"=====}}====
245 LPRINTCHR$(10)
246 W$="####,###"
250 INPUT"QUANTITY";Q$
260 INPUT"ITEM #";I$
270 INPUT"PRICE";M
280 LPRINT TAB(1);Q$;TAB(12);I$;TAB(56) USING W$;M
285 B=B+M
295 INPUT"TYPE 1 FOR ADDITIONAL ITEMS, TYPE 2 TO TOTAL";K$
300 IF K$="1"GOTO250
304 LPRINTCHR$(10)
```


Program Listing continued

```

305 LPRINT"=====§:===
310 LPRINTCHR$(10)
320 LPRINT TAB(45)"SUB TOTAL : " USING W$;B
321 INPUT"DISCOUNT";Z
323 LPRINT TAB(45)"          "USING W$;Z
325 R=B-Z
329 S=R*.06
330 LPRINTTAB(45)"TAX          ":"USING W$;S
340 INPUT"SHIPPING CHARGES";F
350 LPRINT TAB(45)"POSTAGE    ":"USING W$;F
360 T=R+S+F
370 LPRINTTAB(45)"TOTAL      ":"USING W$;T
380 INPUT"DEPOSIT ";D
390 LPRINT TAB(45)"DEPOSIT    ":"USING W$;D
400 G=T-D
410 LPRINTTAB(45) "BALANCE   ":"USING W$;G
500 LPRINTCHR$(12)

```

INVITATIONS BY CAROLYN

931 FOREST GREEN DRIVE, CORAOPOLIS, PA. 15108 264-0979

DATE APRIL 1ST
NAME MISS JANNE DOE
ADDRESS 987 EAGLE DRIVE
CITY AMBRIDGE
PHONE 555-0836

QUAN

100
100

DESCRIPTION PRICE
\$25.00
\$25.00

INVITATIONS BY CAROLYN

931 FOREST GREEN DRIVE, CORAOPOLIS, PA. 15108 264-0979

DATE APRIL 9TH
NAME MELISSA WHITE
ADDRESS 3487 BEAVER GRADE ROAD
CITY PITTSBURGH
PHONE 555-1212

QUAN	DESCRIPTION	PRICE
1000	C-453-A WEDDING INVITATIONS	\$45.00
500	N-098-W NAPKINS	\$25.00
250	T-871-A THANK YOU NOTES	\$25.00

SUB TOTAL : \$95.00
TAX : \$0.00
POSTAGE : \$5.70
TOTAL : \$105.45
DEPOSIT : \$50.00
BALANCE : \$55.45

Sample Run

Measuring Readability of Text

How easily you understand written material depends not so much on subject as on the readability of the text. This program can help you determine the suitability of school books for various age levels. Or, you can modify the program to analyze your own business and personal writing.

—BY STEVE IRVING AND BILL ARNOLD—

Education has progressed a great technological distance since the one-room schoolhouse. But there is still room for progress in the teaching of skills used to decode and understand written material. Teachers need help not only in determining what reading level is appropriate for each child, but also what level a particular book represents. The following program will indicate the grade-level of difficulty of a given book.

Reading specialists generally agree that the "readability" of material (the set of factors independent of content that makes material easy or difficult) has to be graded. Specialists also feel that books should be stimulating in terms of a child's own background and interests. A book should have instructional value and be understandable, not frustrating, to the children using it.

One of the most accurate and useful mathematical tests of text difficulty was developed by Dr. J.R. Bormuth of Indiana University in 1969. His formula is based on comprehension tests which measure students' ability to pick out missing words from text.

The test defines a text's difficulty with a regression equation that is dependent on the number of difficult words in a passage, the average word length and the average sentence length. The formula is reproduced in Figure 1.

In his formula, Bormuth chose "dif-

ficult words" to mean those which do not appear on the Dale Long List, a standard reference of sight words. (That list can be found in *The Educational Research Bulletin*, Vol. 27, Number 2.)

Unfortunately the Dale Long List involves extensive table look-up which means big memory and/or time requirements. Don't stop now, though. It's possible to mathematically estimate the number of difficult words in terms of other parameters in the equation. This estimate (see Figure 1) has very good correlation with the values given by the full formula for younger children's

reading matter. However, for technical writing and prose with a Bormuth value over 68, equivalent to approximately 11th grade-level reading material, the estimate tends to be consistently less than the value obtained on the full Bormuth scale.

The estimation routine is included in the PET-BASIC computer program for the Bormuth formula shown in Figure 2.

Now we'll look through the program section-by-section. Lines 20 to 40 set up the variables and accept the passage into memory, one character at a time. Lines 50 to 70 will first count spaces to

Figure 1 — Scaled Equation to Calculate Readability

$$R = 100 * 1 - (.886593 - .08364 (L/W) + .161911(DLL/W)^3 - .021401 (W/SEN) + .000577 (W/SEN)^2 - .000005(W/SEN)^3)$$

where: L = number of letters in passage
W = number of words in passage
DLL = number of words on the Dale Long List (easy words)
SEN = number of sentences in the passage

To estimate the number of Dale list words in the passage, substitute:
 $W * (1 - (.05 * ((L/W) - 3.2)))$
for DLL in the Bormuth formula above.

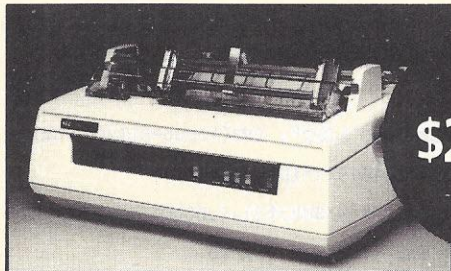
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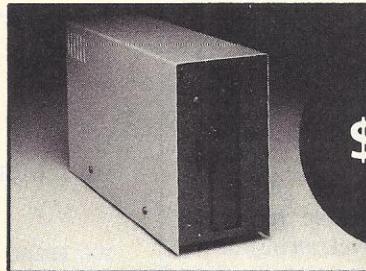


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determine how many words there are in the passage. Then this section counts appropriate punctuation (periods, question marks and exclamation points) to determine how many sentences there are. Then it counts an input character with internal representation between 65 and 90 (A to Z) as a letter and ignores all the other possible characters, such as commas, numbers or parentheses. Line 80, unless it finds a "@" which signals the end of the passage, jumps back to get the next character (line 30).

Between lines 100 and 190 the program displays the number of words, letters, sentences, average word and sentence lengths, and estimated percentage of easy words. Using these figures it computes the passage's readability. Then, in lines 200 to 220, it prints the Bormuth index, clears the variables and jumps back to the beginning to get a new passage.

Reading experts say that students each have *three* identifiable reading levels: an independent level, an instructional level and a frustration level. Where a student feels comfortable picking up a book or magazine is that student's independent reading level. Generally students will accept material to read independently if they understand at least 90% of it. For classroom instruction in reading and language arts, the written material should be more difficult. Experts say that a good level to aim for with instructional material is to have 75% already understood by the student and 25% introducing significant new language concepts and vocabulary. A student's third reading level is his level of frustration where, educational psychologists say, students resist using the book because

they can comprehend less than 50%.

All elementary schools periodically assess each student's reading ability and attempt to provide appropriate-level instruction in reading courses. Until now it has been too complex to coordinate the reading difficulty of texts in social studies, health and science with the carefully chosen difficulty level of language arts and reading books. Material in these courses should be readable around a student's independent reading level. Until now,

though, teachers had to rely on subjective impression or manufacturer's estimate, when available, of the difficulty of these books.

The New York State Department of Education, Division of Educational Testing, has prepared approximate grade-level equivalents for Bormuth-scaled material. Their conversion table is shown in Figure 3.

In Figure 4 you can see the computed readability of a variety of types of published material. □

Figure 2 — Program Listing

```

20 CLR: PRINT "BEGIN INPUT NOW..."
30 GET L$: IF L$ = "" THEN GO TO 30
40 PRINT L$;
50 IF L$="." OR L$="?" OR L$="!" THEN SEN=SEN+1 : GO TO 30
60 IF ASC(L$) > 64 AND ASC(L$) < 91 THEN LE=LE+1 : GO TO 30
70 IF L$=" " THEN W=W+1 : GO TO 30
80 IF L$ <> "@" THEN GO TO 30
100 PRINT: PRINT W; "WORDS"; SEN; "SENTENCES"; LE; "LETTERS"
110 DLL=W*(1-(.05*((LE/W)-3.25))); IF DLL > W THEN DLL=W
120 PRINT "WORDLENGTH"; INT(100*LE/W)/100, "SENTENCE LENGTH";
    INT(10*W/SEN)/10
130 PRINT "ESTIM. PERCENT ON DALE LONG LIST"; INT(10000*DLL/W)/100
140 R = .886593 - (.08364*(LE/W)) + (.161911*(DLL/W)↑3)
    - (.021401*(W/SEN)) + (.000577*(W/SEN)↑2) - (.000005*(W/SEN)↑3)
200 PRINT "READABILITY INDEX="; INT (1000*(1-R))/10
210 PRINT
220 GOTO 20

```

Figure 3

**GRADE LEVEL EQUIVALENCE
OF THE READABILITY NUMBER**

READABILITY NUMBER	GRADE LEVEL
39	1-8
48	3-2
55	5-6
59	7-8
65	9-10
69	11-12
72	13-15
76	16+

Figure 4 — Readability Figures

	Average word length	Average sentence length	Estim. percent Dale easy words	Bormuth index
Children's fiction:				
Marvin K. Mooney	3.34	5.1	99.5	32.8
Gus and the Baby Ghost	4.17	9.7	94.9	49.0
Harry the Dirty Dog	4.01	14.6	96.2	51.0
Reading texts:				
Lift Off* (Merrill)				43
Endings (Macmillan)	3.88	13.5	96.8	48.7
Discovering Treasure (Scott Foresman)	*			49
Other material:				
Isaac Asimov's Science Fiction M.	4.60	16.5	93	58.5
The New York Times	4.96	23.4	91.4	65.3

*measured by Bureau of Reading Education, University of the State of NY

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domized opening book up to 6 levels of play for 3 moves. When setting up the board, the user can scan up and down, left and right. And finally, you

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Who Am I?

BY JOHN B. PALMER

Noah, Abraham, Naomi, David, Esther — the Biblical characters hold as much power and fascination today as they did thousands of years ago. Told and re-told for generations, the stories of their lives and deeds have lost no significance or grandeur to the passage of time.

This simple program, based on the parlor game "Who Am I?", tests your knowledge of Biblical characters and also helps children learn the stories of the Bible. With modifications, it can serve equally well to teach about characters from American or world history or other areas. No score is kept; the object is education and enjoyment.

The computer, playing the role of a person from the past, answers "yes" or "no" to any of eight categorical questions. When you enter a wrong guess, the computer will tell if the mystery person lived before or after the wrong guess. (See Sample Run 1.)

At the start of the program you have the option of seeing the rules, questions and names. During the game you may ask to see the question list by entering a 0 or the name list by entering a 9. Experienced players prefer to play without looking at the names.

One feature of this program is the spelling test. When the program cannot match the player's guess with any name in the DATA statements, string functions are used to find a similar name and the player is warned about the proper spelling.

The spelling routine has a minor logical error, causing the word "NO" to be printed several times. Although I've left it in, you may want to fix it.

The eight questions used are intentionally very broad. Some are dual questions that depend on whether the subject was a man or a woman. Note question 8, for example. Very few of the influential women were leaders of their nations, so the question asks if the character was either a famous leader or a famous mother.

All you enter is the question number; the computer prints out the question.

The program works on any BASIC with strings, and requires about 3500 bytes of free memory. Users of North Star, Processor Technology or other BASICs that use HP string conventions can copy and run this program without changes. For Microsoft and BASICs using DEC strings, a few statements will have to be changed. The listing and sample runs were made with Processor Technology's Extended BASIC.

This program may really slow down your computer. Keep in mind that it was written both to conserve memory space and to run on many popular BASIC systems.



Program Notes

String input statements and functions to test strings and individual letters within a string are vital to this program. Thus, 4K BASIC will be excluded unless the user has added string features. Floating point is not needed, but minor changes would have to be made in lines 1760 and 1770.

Rules and other options could be eliminated, allowing more memory space, by deleting 1020 to 1210. The main program loop extends from line 1250 through 1320.

Most routines are identified by a REM statement. Lines 1480 to 1570 are used to print either one or all of the questions.

The name list routine is formatted for a 32-position display. However, you can change the number 32 in lines 1620 and 1640 to whatever width you like.

The most obscure area, lines 1750 to 1770 is a bit test. To cut down on the amount of data in the DATA statements, the information was compressed into binary.

Illustration by David Bastille

Simply stated, we need to test a bit in the Variable F, taken from the DATA at the start of a new game. Q is the question number input by the player. Whenever F has a binary one in bit position Q-1 then the answer to the question is "Yes". The awkward steps in 1750 and 1760 are needed for the many BASIC versions that have no provision for bit test at the machine level.

If you want to test the accuracy of either the information in the DATA statements or the performance of the above mentioned bit test, start the program at line 2000. You should get a question profile like the one in Sample Run 2. You may need this test if you make changes in the program.

It's easy to extend or alter the information in the DATA statements. Remember that each name must be followed by a decimal number which rep-

resents a binary number. For each question there is a power of two that indicates a "yes" answer.

Let's see how this works. We have eight questions, so we'll need to know the powers of two from zero through seven. They are: 1, 2, 4, 8, 16, 32, 64, 128.

Now, suppose we want to add a name to the DATA statements that would answer "yes" only to questions two, three and four. 2 plus 4 plus 8 equals 14. Thus, 14 would be the right value to place in the DATA statement after the name.

Of course you may put as many DATA items as you wish on one line, but the last item must not be followed by a comma or an error may result. When inserting names, be sure to observe the chronological order. If in doubt consult an encyclopedia or other reference

work. If you change the total number of names, then change the value of D in 1200.

How about a list of names from a different period in history? This modification requires a lot of work. The objective is to make a list of important people who lived over a span of centuries. Next, sort them into a few broad categories. The categories will form the structure of the questions for lines 1490 to 1560. It's likely that you'll have to combine some questions to avoid overly specific questions that would pinpoint a particular person too easily.

My objective was to write a computer game that everyone would enjoy. Because it doesn't stress competitiveness among players, "Who Am I?" is fun for adults and children to play together. I hope you will enjoy using the game. □

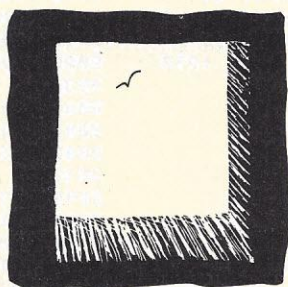
Sample Run 1

```

RUN
WHO AM I ?
-AN EDUCATIONAL GAME
RANDOM NUMBER ?8
DO YOU WANT RULES (Y/N) ?N
QUESTIONS (Y/N) ?N
NAMES (Y/N) ?N

GREETINGS -GUESS MY NAME OR ELSE
INVOKES A QUESTION BY ITS NUMBER
WHO AM I ?3
ONE WHO SAW CAPTIVITY ?
NO, I AM NOT. WHO AM I ?SAUL
I WAS BEFORE SAUL
WHO AM I ?5
ONE OF WOMANKIND ?
YES, I AM. WHO AM I ?RUTH
I WAS BEFORE RUTH
WHO AM I ?9
CHRONOLOGICAL NAME LIST
ADAM EVE CAIN ABEL NOAH ABRAHAM
SARAH LOT HAGAR ISAAC REBEKAH
JACOB RACHEL JOSEPH MOSES JOSHUA
RAHAB DEBORAH SAMSON NAOMI RUTH
HANNAH SAMUEL SAUL DAVID
BATH-SHEBA SOLOMON
QUEEN-OF-SHEBA JONAH ISAIAH
EZEKIEL JEREMIAH DANIEL ESTHER
EZRA NEHEMIAH
WHO AM I ?4
SURVIVOR OF A CALAMITY ?
NO, I AM NOT. WHO AM I ?SARAH
I CAME AFTER SARAH
WHO AM I ?1
OF THE ROYAL LINE ?
NO, I AM NOT. WHO AM I ?REBEKAH
TRY AGAIN TO SPELL REBEKAH
WHO AM I ?REBEKAH
I WAS BEFORE REBEKAH
YOU HAVE HAD FOUR TRIES-
I AM HAGAR
WOULD YOU MEET ANOTHER (Y/N) ?N
SHALOM
READY

```



```

GREETINGS -GUESS MY NAME OR ELSE
INVOKES A QUESTION BY ITS NUMBER
WHO AM I ?2
NAMED IN A BOOK TITLE ?
NO, I AM NOT. WHO AM I ?DABID
TRY AGAIN TO SPELL DAVID
WHO AM I ?DAVID
I WAS BEFORE DAVID
WHO AM I ?4
SURVIVOR OF A CALAMITY ?
NO, I AM NOT. WHO AM I ?ABRAHAM
I CAME AFTER ABRAHAM
WHO AM I ?5
ONE OF WOMANKIND ?
YES, I AM. WHO AM I ?7-RUTH
I WAS BEFORE RUTH
WHO AM I ?1
OF THE ROYAL LINE ?
YES, I AM. WHO AM I ?SARAH
I CAME AFTER SARAH
YOU HAVE HAD FOUR TRIES-
I AM REBEKAH
WOULD YOU MEET ANOTHER (Y/N) ?Y

GREETINGS -GUESS MY NAME OR ELSE
INVOKES A QUESTION BY ITS NUMBER
WHO AM I ?GOLIATH
I AM NOT THAT ONE
WHO AM I ?WHOAREYOU?
DON'T TYPE QUESTION MARK
WHO AM I ?WHO
I AM RUTH
WOULD YOU MEET ANOTHER (Y/N) ?N
SHALOM
READY

```

Sample Run 2

```

RUN 2000
INVOKES A QUESTION BY ITS NUMBER
0=TO REVIEW QUESTION LIST
1=OF THE ROYAL LINE ?
2=NAMED IN A BOOK TITLE ?
3=ONE WHO SAW CAPTIVITY ?
4=SURVIVOR OF A CALAMITY ?
5=ONE OF WOMANKIND ?
6=A PROPHET/PROPHETESS ?
7=VIOLENT MAN/POOR WIDOW ?
8=A FAMOUS LEADER/MOTHER ?
9=TO SEE NAME LIST

Q# 1 2 3 4 5 6 7 8
ADAM Y
EVE Y Y Y
CAIN Y
ABEL Y Y Y
NOAH Y Y Y
ABRAHAM Y
SARAH Y Y Y
LOT Y
HAGAR Y
ISAAC Y
REBEKAH Y Y
JACOB Y

Q# 1 2 3 4 5 6 7 8
RACHEL Y Y
JOSEPH Y Y
MOSES Y Y Y Y
JOSHUA Y Y Y Y
RAHAB Y Y Y
DEBORAH Y Y
SAMSON Y Y Y
NAOMI Y Y
RUTH Y Y Y Y
HANNAH Y Y
SAMUEL Y Y
SAUL Y Y Y Y

Q# 1 2 3 4 5 6 7 8
DAVID Y Y Y
BATH-SHEBA Y Y Y
SOLOMON Y Y Y
QUEEN-OF-SHEBA Y Y Y
JONAH Y Y Y
ISAIAH Y Y Y
EZEKIEL Y Y Y
JEREMIAH Y Y Y
DANIEL Y Y Y
ESTHER Y Y Y
EZRA Y Y Y
NEHEMIAH Y Y Y
READY

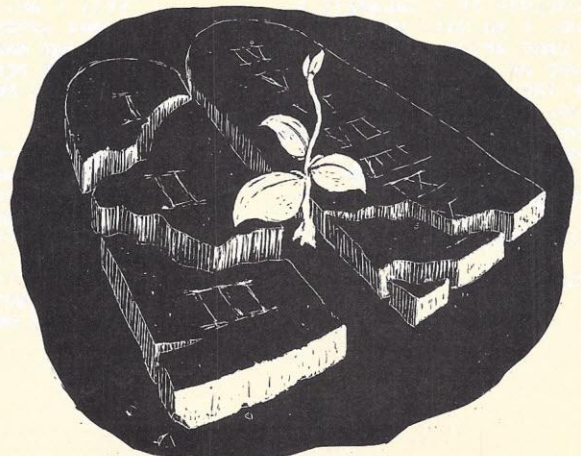
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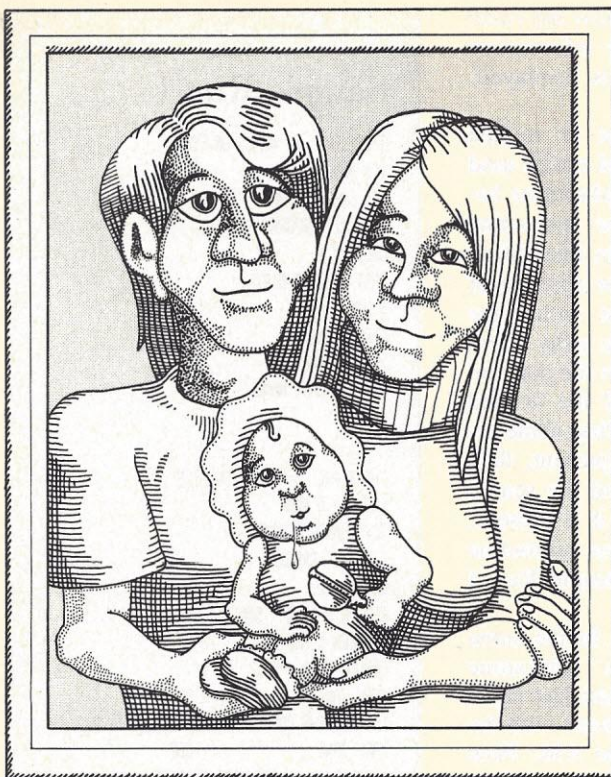

Program Listing

```

1000 DIM A$(18),G$(16),N$(16),Q$(32),W$(16)
1010 LET IS=" WHO AM I ": PRINT IS;"?"
1020 PRINT "-AN EDUCATIONAL GAME"
1030 PRINT "RANDOM NUMBER ": INPUT F
1040 FOR N=0 TO F: LET D=RND(0): NEXT N
1050 PRINT "DO YOU WANT RULES": GOSUB 1400
1060 IF Y=0 THEN 1170: REM** REV PTEX **
1070 PRINT "RULES": REM** JB PALMER AUG78 **
1080 PRINT " THE COMPUTER SHALL PRETEND"
1090 PRINT "TO BE WELL-KNOWN PERSON FROM THE"
1100 PRINT "PAST THAT YOU MAY IDENTIFY."
1110 PRINT "ON FOUR GUESSES IT IS UNVAILED."
1120 PRINT "YOU MUST SPELL EXACTLY."
1130 PRINT "YOU MUST QUESTION BEFORE GUESS."
1140 PRINT "THE QUESTIONS ARE IN ORDER OF"
1150 PRINT "IMPORTANCE AND PRIORITY, BUT"
1160 PRINT "YOU MAY QUESTION IN ANY ORDER."
1170 LET Q$="INVOKE A QUESTION BY ITS NUMBER"
1180 PRINT "QUESTIONS": GOSUB 1400
1190 IF Y<>0 THEN GOSUB 1440
1200 LET D=36: PRINT "NAMES": GOSUB 1430
1210 IF Y<>0 THEN GOSUB 1590
1220 LET T=0: GOSUB 1660
1230 PRINT : PRINT "GREETINGS "
1240 PRINT "-GUESS MY NAME OR ELSE": PRINT Q$
1250 PRINT IS: INPUT A$: IF A$(1,1)<"0" THEN 1250
1260 LET L=LEN(A$): IF A$(L,L)<"?" THEN 1230
1270 PRINT "DON'T TYPE QUESTION MARK": GOTO 1250
1280 IF A$=W$ THEN 1350
1290 IF LEN(A$)>16 THEN LET A$="0"
1300 IF A$<" " THEN GOSUB 1690: GOTO 1250
1310 IF A$(1,1)="W" THEN 1340
1320 GOSUB 1790: IF T<4 THEN 1250
1330 PRINT "YOU HAVE HAD FOUR TRIES-"
1340 PRINT " I AM ": GOTO 1360
1350 PRINT "WELL DONE, I AM "
1360 PRINT W$: PRINT "WOULD YOU MEET ANOTHER"
1370 GOSUB 1400: IF Y=1 THEN 1220
1380 IF Y<>0 THEN 1050
1390 PRINT "SHALOM": END
1400 LET Y=-1: PRINT " (Y/N ) ": INPUT Y$
1410 IF Y$(1,1)="Y" THEN LET Y=1
1420 IF Y$(1,1)="N" THEN LET Y=0
1430 RETURN
1440 LET Q=0: PRINT Q$: REM**** QUESTIONS ****
1450 PRINT Q:" ": GOSUB 1480
1460 LET Q=Q+1: IF Q<10 THEN 1450
1470 RETURN
1480 IF Q=0 THEN PRINT "TO REVIEW QUESTION LIST"
1490 IF Q=1 THEN PRINT "OF THE ROYAL LINE ?"
1500 IF Q=2 THEN PRINT "NAMED IN A BOOK TITLE ?"
1510 IF Q=3 THEN PRINT "ONE WHO SAW CAPTIVITY ?"
1520 IF Q=4 THEN PRINT "SURVIVOR OF A CALAMITY ?"
1530 IF Q=5 THEN PRINT "ONE OF WOMANKIND ?"
1540 IF Q=6 THEN PRINT "A PROPHET/PROPHETESS ?"
1550 IF Q=7 THEN PRINT "VIOLENT MAN/POOR WIDOW ?"
1560 IF Q=8 THEN PRINT "A FAMOUS LEADER/MOTHER ?"
1570 IF Q=9 THEN PRINT "TO SEE NAME LIST"
1580 RETURN
1590 PRINT "CHRONOLOGICAL NAME LIST"
1600 RESTORE : LET H=0: FOR N=1 TO D
1610 READ N$: READ F$: LET L=LEN(N$)
1620 IF H+L>32 THEN PRINT : LET H=0
1630 PRINT N$: LET H=H+L
1640 IF H<>32 THEN PRINT " ": LET H=H+1
1650 NEXT N: PRINT : RETURN
1660 RESTORE : REM**** SELECT WHO ****
1670 LET W=INT(RND(0)*D+1): FOR N=1 TO W: READ W$
1680 READ F$: NEXT N: LET F=VAL(F$): RETURN
1690 LET Q=VAL(A$): REM**** A QUESTION ****
1700 IF (Q=0)+(Q>9) THEN 1440
1710 IF Q=9 THEN 1590
1720 GOSUB 1480: GOSUB 1750
1730 IF Y=0 THEN PRINT " NO, I AM NOT.": RETURN
1740 IF Y=1 THEN PRINT " YES, I AM.": RETURN
1750 LET B=1: FOR A=1 TO Q-1: LET B=2*B
1760 NEXT A: LET Y=1: LET A=INT(F/B)
1770 IF A/2=INT(A/2) THEN LET Y=0
1780 RETURN : REM**** GUESS WHO ****
1790 RESTORE : LET G=0: LET P=1: FOR N=1 TO D
1800 READ G$: READ F$: IF A$=G$ THEN LET G=N
1810 NEXT N: IF G=0 THEN 1850
1820 IF W<G THEN PRINT "I WAS BEFORE ":A$
1830 IF W>G THEN PRINT "I CAME AFTER ":A$
1840 LET T=T+1: RETURN
1850 LET P=1: REM**** SPELLING ****
1860 LET N=0: RESTORE
1870 READ G$: READ F$
1880 IF A$(1,1)<>G$(1,1) THEN 1960
1890 LET A=LEN(A$): LET B=LEN(G$)
1900 IF (P=3)+(P=4) THEN 1920
1910 IF A$(A,A)<>G$(B,B) THEN 1960
1920 IF A=B THEN 1990
1930 PRINT "NO "
1940 IF (P=1)+(P=3) THEN 1960
1950 IF (A=B+1)+(A=B-1) THEN 1990
1960 LET N=N+1: IF N<D THEN 1870
1970 LET P=P+1: IF P<5 THEN 1860
1980 PRINT "I AM NOT THAT ONE": RETURN
1990 PRINT "TRY AGAIN TO SPELL ":G$: RETURN
2000 REM**** DISPLAY ANSWERS ****
2010 GOSUB 1440: LET K=0: LET D=36: RESTORE
2020 READ W$: READ F$: LET F=VAL(F$)
2030 IF K/12<>INT(K/12) THEN 2050
2040 PRINT TAB(12);"Q# 1 2 3 4 5 6 7 8"
2050 PRINT W$:TAB(15);: LET Q=1
2060 GOSUB 1750: IF Y=0 THEN PRINT " ";
2070 IF Y=1 THEN PRINT " Y";
2080 LET Q=Q+1: IF Q<9 THEN 2060
2090 PRINT : LET K=K+1: IF K<D THEN 2020
2100 REM**** NAMES AND FACTS ****
2110 DATA "ADAM","1","EVE","145"
2120 DATA "CAIN","64","ABEL","0"
2130 DATA "NOAH","41","ABRAHAM","1"
2140 DATA "SARAH","145","LOT","8"
2150 DATA "HAGAR","16","ISAAC","1"
2160 DATA "REBEKAH","17","JACOB","1"
2170 DATA "RACHEL","16","JOSEPH","36"
2180 DATA "MOSES","172","JOSHUA","206"
2190 DATA "RAHAB","25","DEBORAH","48"
2200 DATA "SAMSON","196","NAOMI","80"
2210 DATA "RUTH","211","HANNAH","144"
2220 DATA "SAMUEL","34","SAUL","192"
2230 DATA "DAVID","193","BATH-SHEBA","145"
2240 DATA "SOLOMON","131","QUEEN-OF-SHEBA","144"
2250 DATA "JONAH","42","ISAIAH","34"
2260 DATA "EZEKIEL","38","JEREMIAH","46"
2270 DATA "DANIEL","46","ESTHER","150"
2280 DATA "EZRA","6","NEHEMIAH","130"
2290 REM**** END OF LIST ****

```





Tracing Your Family Tree

Roots and Branches

BY JOHN J. ARMSTRONG

Researching your family tree — a fascinating hobby — means collecting bundles of facts on paper from letters, block family tree diagrams and other records. Organizing this material can develop into quite a project, as my elderly aunt discovered. I volunteered to help her arrange her facts with my computer. You can use this program too in your search for roots and branches of your family tree.

If you haven't already collected your family data, I suggest you begin at a local library. They can give you genealogy background and advice. You can also use the Pedigree Chart from the Genealogical Society of Utah. This block-type tree form, available from your library or local genealogy society, will help you input data to the computer since it organizes names, dates, places and relationships.

Manipulation of data by the computer is accomplished through two programs. ADDNAME adds names to the FAMILY data file and allows you to change or correct names. TREE inputs, changes and manipulates the information. Because these programs are separate, the changing and adding of names is a very deliberate and separate process.

My computer system consists of a TRS-80 with 48K RAM, two disks with version 1.1 of Radio Shack Disk BASIC and the tractor-fed line printer. The printer is essential for various outputs.

The number of persons you can store

data on is limited by the available space on one diskette. A single disk drive system has part of its available space occupied by the DOS and Disk BASIC. Thus, if no user programs are on the system (DOS) diskette, where the FAMILY file must reside, there should be room for about 230 persons (the number of free disk sectors). The TREE and ADDNAME programs must then be stored on a system diskette separate from the one holding the FAMILY file.

On the other hand, a multiple disk drive system provides the convenience of storing the program on the system (drive 0) diskette and the FAMILY file on drives 1, 2 or 3. A diskette on one of these drives without user programs will have 340 sectors free for name and data storage.

Now, let's outline some general steps. After you've roughly charted your family tree, use the ADDNAME program to put those names in the FAMILY file. Then, using the TREE program, get a printout of all persons and their ID numbers. Using this printout and the "Pedigree Charts" or other records, commit to the file birthdates and places, dates and places of marriage and remarriage, spouses, dates of death, places of life or death, number of children, and so forth. Continuing to use the TREE program, review, correct or print any person's data. Then, plot a person's predecessors (roots) or descendants (branches) in an indented format spanning up to seven generations.

ADDNAME Program Notes

Line 20 reserves string space and opens the data file. You'll need to experiment to determine the string space requirements of your FAMILY file. As a starting point, try reserving 1000 bytes plus 25 bytes for each person on file. A change will be necessary should either of the error messages, "out of string space" or "out of memory", be displayed. C\$ is dimensioned in line 30 since provision has been made for storage of up to 13 children per person.

Line 70 gives the main program choices. The add-a-name routine's line 130 calculates the ID number of a new person to be filed, formats the file buffer for access to the name portion of the sector, and fills the file buffer with the contents of the destination sector. The new names are inputted and placed on the disk through line 140.

Lines 150 to 190 initialize the new person as having an unknown birthdate and place. This new person is also shown as living at an unknown location with blank dates and places of marriage and remarriage and without spouses, children or parents. Lines 220 to 250 begin the change-a-name routine by accepting the input of an ID number and checking its validity. Lines 280 and 320 allow escape from the change-a-name routine. With lines 410 to 490 you can add or change names. Subroutines beginning with lines 510 and 560 field the file buffer for the proper portion involved in initialization. Line 630

blanks the input string A\$ so that its previous contents are not brought forward. This feature is useful in the add-a-name routine when no married name exists; just pressing enter will give a blank married name.

See Figure 1 for a flowchart of this program and Table 1 for a description of its variables. See Sample Run 1 for an example of ADDNAME.

TREE Program Notes

Line 30 defines all variables as integers (though many are subsequently redefined as strings) to speed execution and reduce memory usage. Line 40 defines a function which formats the dates with separating hyphens while line 50 dimensions the name arrays to the maximum number of names on file. Lines 60 to 120 read the names from the disk and strip away the right-side blanks, finally storing them in the arrays and displaying them on the video.

The main program options are defined in lines 130 and 140. The modes of file access are defined in lines 150 to 170 and these choices are made in lines 190 and 240. The modes of access subroutines are called in line 250.

A flowchart of this program is given in Figure 2, and Table 2 describes variables not covered in Table 1. See Sample Run 2 for a sample of the video sequence in determining the main program options and mode of access.

File Access

Last name. The subroutine beginning with line 270 searches for a match between the last name input and the elements of the last name array. If a match is found, then the previously chosen main option subroutine is called in line 320. An input request to con-

tinue is provided here to slow the video allowing you to view the information before the next portion is displayed. See Sample Run 3.

First name. The first or middle name or even just an initial can be used as an access key in the subroutine beginning in line 350. The subroutine uses the INSTR function in line 390 to search for the presence or absence of your "first name" input within the elements of the first name array. Here the variable Y will contain the position of the first occurrence of the desired "first name" within the first name array element. If it is not present, then variable Y is set to 0 and the search continues in line 410. If it is present, then the chosen main option subroutine is called in line 400. Sample Run 4 shows this type of access.

Married Last Name. In the same fashion as the "last names" subroutine access method, the married last name can be used to access persons with the subroutine starting in line 430. Here the married name array is searched for a match with the inputted married name. Sample Run 5 demonstrates this method.

All Entries. The fourth access method subroutine begins in line 510. Here, access to all entries is attained for either editing, displaying, printing or tree-printing, according to the preselected subroutine called in line 550. The selection of "print on printer" in line 190 plus the subsequent choice of "all entries" in line 240 plus the further choice of "names only" in subroutine 3380 will give a printout of names of all persons on file with their ID numbers. This list helps in editing family relationships since the ID numbers are needed. Sample Run 6 shows the beginning of this type of access.

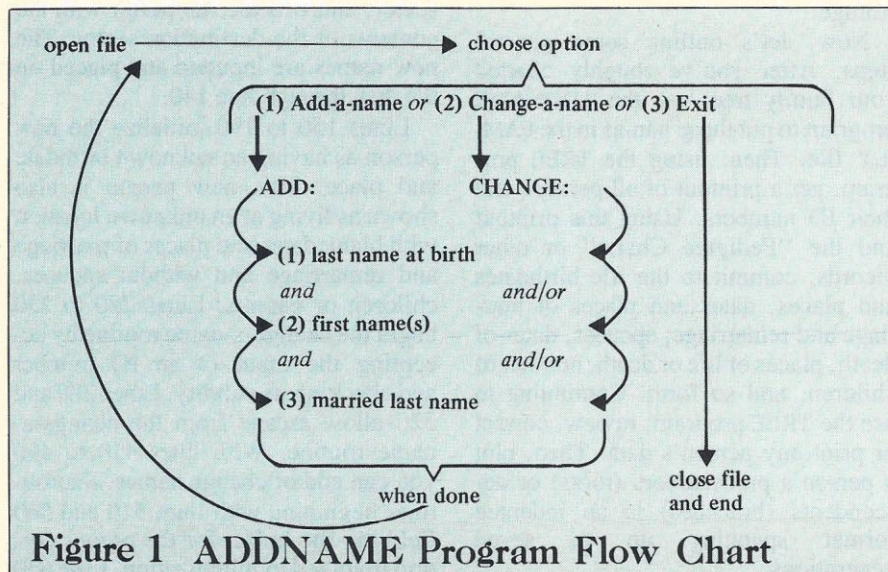


Figure 1 ADDNAME Program Flow Chart

Sample Run 1

```

THERE ARE 0 NAMES ON FILE
(1) ADD A NAME
(2) CHANGE A NAME
(3) EXIT PROGRAM
CHOICE? 1
LAST NAME AT BIRTH
? DOE
FIRST NAME(S)
? MARY JANE
MARRIED LAST NAME
?
  
```

```

THERE ARE 1 NAMES ON FILE
(1) ADD A NAME
(2) CHANGE A NAME
(3) EXIT PROGRAM
CHOICE? 2
PERSON'S ID # ? 500
BETWEEN 1 AND 1
PERSON'S ID # ? 1
MARY JANE          DOE
IS THIS THE CORRECT ONE TO CHANGE (Y/N)? Y
MARY JANE          DOE
CHANGE ( 1 ) LAST NAME AT BIRTH
CHANGE ( 2 ) FIRST NAME(S)
CHANGE ( 3 ) MARRIED LAST NAME
HOW MANY CHANGES? 1
CHANGE ITEM # ? 3
MARRIED LAST NAME
CHANGE              TO :? JONES
  
```

```

THERE ARE 1 NAMES ON FILE
(1) ADD A NAME
(2) CHANGE A NAME
(3) EXIT PROGRAM
CHOICE? 2
PERSON'S ID # ? 1
MARY JANE          DOE          JONES
IS THIS THE CORRECT ONE TO CHANGE (Y/N)? N
  
```

```

THERE ARE 1 NAMES ON FILE
(1) ADD A NAME
(2) CHANGE A NAME
(3) EXIT PROGRAM
CHOICE? 3
THERE ARE 1 NAMES ON FILE
AND THE FILE HAS BEEN CLOSED.
  
```

Sample Run 2

```

( 1 ) EDIT
( 2 ) DISPLAY ON VIDEO
( 3 ) PRINT ON PRINTER
( 4 ) PRINT FAMILY TREE
( 5 ) EXIT PROGRAM
CHOICE? 2
(1) NAMES ONLY (2) WHOLE ENTRY
CHOICE? 1
DISPLAY ON VIDEO BY:
( 1 ) LAST NAME AT BIRTH
( 2 ) FIRST OR MIDDLE NAME OR INITIAL
( 3 ) MARRIED LAST NAME
( 4 ) ALL ENTRIES
  
```


Living in Year. The next access route begins in line 580. This mode searches the FAMILY file for each person living in the year you input. Line 630 determines if the value of the year portion of the birthdate string is greater than 1500. This 4-digit year eliminates from consideration for access the following: persons with no known birthdate year, e.g., ???; and persons with an incomplete birthdate, e.g., 175?. This line also checks that the value of the year portion of the date of death string is greater than 1500 or that the person is recorded as "living". If both of those conditions are met, then further determination is done in line 640. In that case, the desired year must be greater than or equal to the year portion of the birthdate string and either the person must be living or the year of death must be greater than or equal to the desired year. If those conditions are met, then that file is accessed via line 650. This mode is shown in Run 7.

All Mentions. The final access method beginning with line 680, accepts input of a last name, either at birth or marriage, and a first name. The last and married name arrays are then searched for a match with the inputted last name. If a match is found, the corresponding first name array element is checked for the presence of the inputted first name using the INSTR function. If a match is also found there, then subroutine 740 is called. A second file search then begins using variable X2 as the loop counter. Line 750 determines if a title containing the matched person's name has been printed or displayed. If it hasn't, a title is printed or displayed in line 760 and the flag variable, X5, is set equal to the person for whom the search is being made. Line 770 and 780 get from the disk, convert from strings and extract into variables, and check for the presence of the searched-for individual as a spouse, a child, or a parent under the person be-

Sample Run 2 cont.

```
( 5 )LIVING IN YEAR...
( 6 )ALL MENTIONS OF PERSON
CHOICE? 3
DISPLAY ON VIDEO
  MARRIED LAST NAME
? LUCAS
MARRIED LAST NAME: 'LUCAS'
  REBECCA SMITH LUCAS
CONTINUE?
```

Sample Run 3

LAST NAME AT BIRTH: 'CASPER'

```
94      JAMES CASPER
95      DONNA LYNN CASPER
96      JAMES STEVEN CASPER
```

Sample Run 4

FIRST OR MIDDLE NAME OR INITIAL: 'JAMES'

```
3      JOHN JAMES ARMSTRONG
36     JAMES SMITH
94     JAMES CASPER
96     JAMES STEVEN CASPER
117    JAMES ARMSTRONG
220    JAMES TED GIERUCKI
```

Sample Run 5

MARRIED LAST NAME: 'LUCAS'

```
223    REBECCA SMITH LUCAS
```

Sample Run 6

ALL ENTRIES:

```
1      ALICE ANN ARMSTRONG
2      KENNETH LEE ARMSTRONG
3      JOHN JAMES ARMSTRONG
4      GLENN MICHAEL ARMSTRONG
5      DAVID ARTHUR ARMSTRONG
6      DAVID CLINTON ARMSTRONG
7      ANNA MARIE GORANSON ARMSTRONG
8      MARY NELLE VINCENT ARMSTRONG
9      AMANDA SUE ARMSTRONG
10     JOSEPH DAVID ARMSTRONG
11     LYNN BETH HULSEY ARMSTRONG
```

Sample Run 7

LIVING IN YEAR...: '1829'

```
113    DAVID SAMPSON ARMSTRONG
114    MARY JANE YARGER ARMSTRONG
116    MARY ELIZABETH MOCLAIN ARMSTRONG
118    SABRA SAMPSON ARMSTRONG
228    LEVI ZIMMERMAN
229    ELIZABETH WILCOUS ZIMMERMAN
```

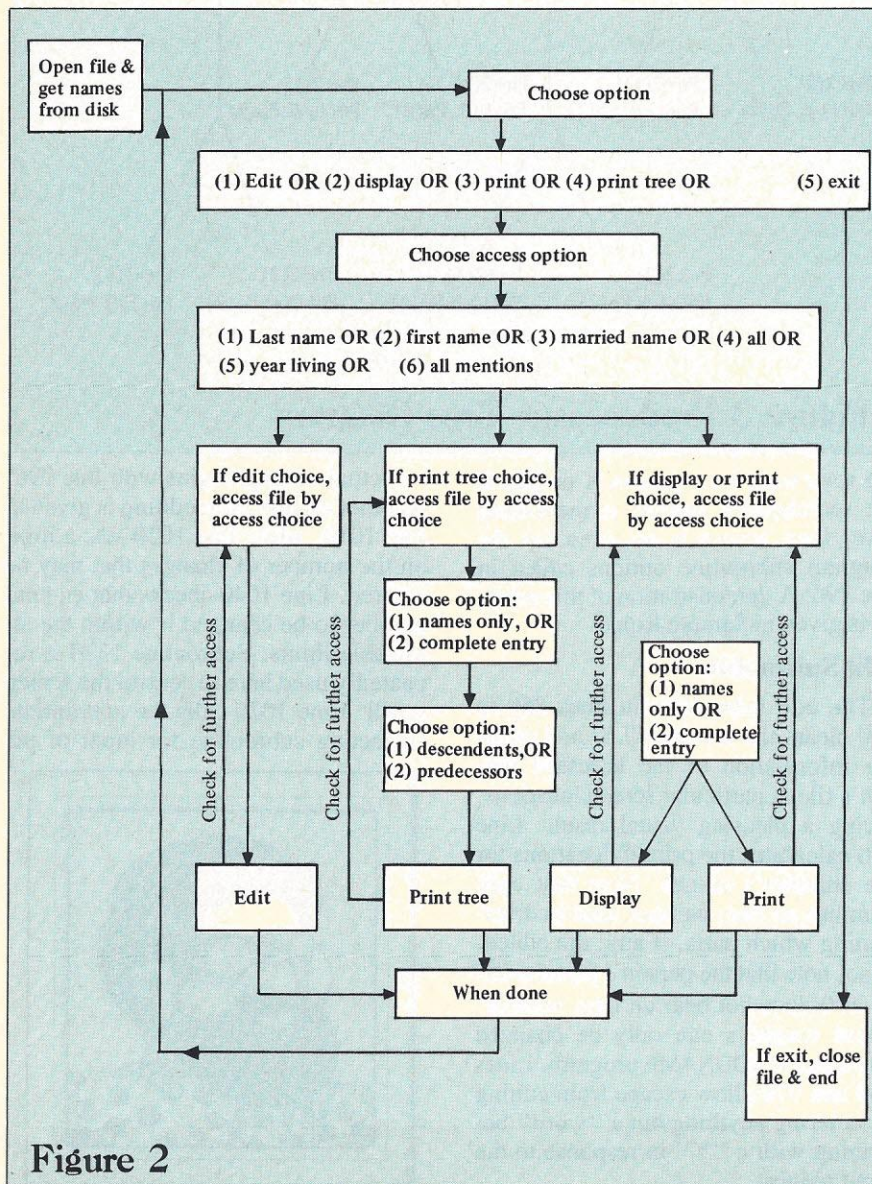


Figure 2

'DAVID ARTHUR ARMSTRONG' IS LISTED UNDER:

6 DAVID CLINTON ARMSTRONG
7 ANNA MARIE GORANSON ARMSTRONG
8 MARY NELLE VINCENT ARMSTRONG
9 AMANDA SUE ARMSTRONG
10 JOSEPH DAVID ARMSTRONG

```
( 1 ) EDIT
( 2 ) DISPLAY ON VIDEO
( 3 ) PRINT ON PRINTER
( 4 ) PRINT FAMILY TREE
( 5 ) EXIT PROGRAM
CHOICE? 1
EDIT BY:
( 1 ) LAST NAME AT BIRTH
( 2 ) FIRST OR MIDDLE NAME OR INITIAL
( 3 ) MARRIED LAST NAME
( 4 ) ALL ENTRIES
( 5 ) LIVING IN YEAR...
( 6 ) ALL MENTIONS OF PERSON
CHOICE? 2
EDIT
```

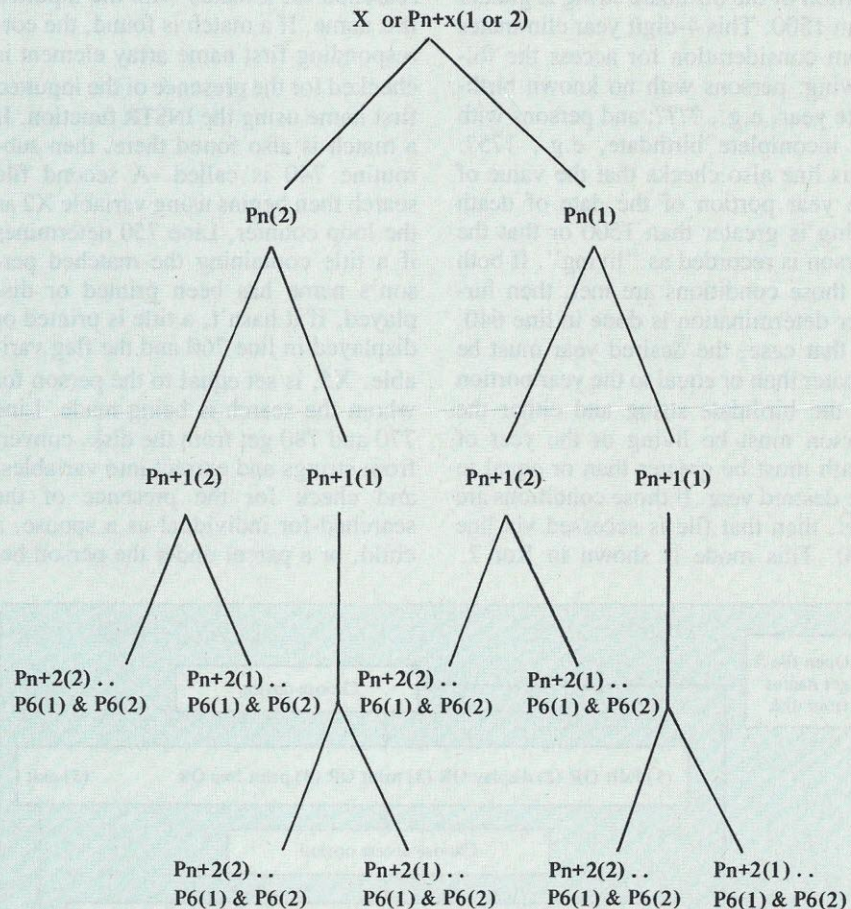
FIRST OR MIDDLE NAME OR INITIAL:
 ? JOHN JAMES
 FIRST OR MIDDLE NAME OR INITIAL: 'JOHN JAMES'
 JOHN JAMES ARMSTRONG
 1) BORN: 02191919492) @ AMARILLO, TEXAS
 3) MARRIED: 4) TO:
 5) @ 6) MARITAL STATUS: SINGLE
 7) REMARRIED: 8) TO:
 9) @ 10) MARITAL STATUS:
 11) DIED/LIVING: LIVING 12) @ MOBILE, ALABAMA
 13) # CHILDREN 0
 27) MOTHER: ANNA MARIE GORGANSON 28) FATHER:
 DAVID CLINTON ARMSTRONG
 ANY CHANGES TO BE MADE HERE (Y/N)? Y
 HOW MANY CHANGES? 1
 CHANGE ITEM # ? 500
 500 IS AN INVALID ITEM # CHANGE ITEM # ?
 500 IS AN INVALID ITEM # CHANGE ITEM # ? 1
 BIRTH DATE (MMDDYYYY)? 0219191948
 CONTINUE?

```

( 1 ) EDIT
( 2 ) DISPLAY ON VIDEO
( 3 ) PRINT ON PRINTER
( 4 ) PRINT FAMILY TREE
( 5 ) EXIT PROGRAM
CHOICE? 1
EDIT BY:
( 1 ) LAST NAME AT BIRTH
( 2 ) FIRST OR MIDDLE NAME OR INITIAL
( 3 ) MARRIED LAST NAME
( 4 ) ALL ENTRIES
( 5 ) LIVING IN YEAR...
( 6 ) ALL MENTIONS OF PERSON
CHOICE? 2
EDIT
FIRST OR MIDDLE NAME OR INITIAL

```

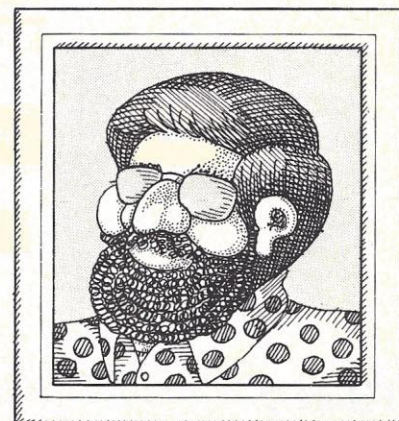
$n+x$ = part of variable name



ing reviewed, i.e., person X or X2. If the searched-for person is mentioned here, then access is acquired for the program subroutine options called in line 790. A demonstration of this method is given in Sample Run 8.

The edit subroutine in lines 850 to 950 clears the screen (CLS) and prints the information of the accessed person's file at particular screen locations, giving a pleasing visual result. Line 930 calculates the print@ locations for the children's names. Note that each item has an item number used in determining which parts, if any, are edited. Also, note that the person's name printed at 0 does not bear an item number. These numbers can only be changed through the ADDNAME program. Lines 960 and 970 allow escape from editing by entering anything but a "word" beginning with a "Y" in response to the input request.

Actual editing begins with line 990. Another escape from editing is given in line 1010, while line 1020 sets a limit on the number of changes that may be entered. Line 1040 checks that an item number to be changed is within the allowable limits. Subroutine 1370 is repeatedly used here to control the screen scroll. Line 1070 calls the appropriate correcting subroutine for input of the



new or corrected information. Note that string input changes are handled as directed in line 1090.

On the other hand, numeric input changes are done through subroutine 1380. Here variable Y holds the cursor position (POS(0)) before input. The new person's ID number is then input and checked for validity. If it is valid, then the return is executed and the numeric value after string conversion (MKI\$(A)) is stored on the disk. If it's invalid, then the error message in line 1410 is displayed and the reinput of the value is requested, using the value of variable Y to return to the correct print@ screen location. CHR\$(29) moves the cursor to the beginning of the line while CHR\$(30) clears to the end of the line.

Note that disk BASIC's line input feature is used in entering places of birth, and similar data. This feature allows you to enter commas as part of the input string, which simplifies the entry of the city and state.

See Sample Run 9.

Display Subroutine

The second main program option begins with line 1440. Line 1460 directs execution between the previously chosen "names only" or "whole entry" forms of output. Line 1500 increments the line counter by 1 with each call of this subroutine. Each access subroutine checks for variable L greater than 13, which indicates a full screen of names. In that case, pressing enter will continue the display. DATE\$ is the formatted date derived from the previously defined string function executed through the call of subroutines 3300, 3310, 3320 and 3330. Note that only the children are indexed with an item number here. Again, the input request, "continue", allows review of the entry before the next one is displayed. See Sample Run 10.

Print Subroutine

The print-on-printer subroutine beginning with line 1680 is the third main program option. Line 1700 directs execution to the short or long version of the output. Note the differences between line 1740 and 1500. Line 1740 prints the ID number and does not increment the line counter. Printing the whole entry begins with line 1760. The places of birth, death or life, marriage and remarriage are stripped of their rightmost blanks via subroutine 3360. This was done to allow compact printing, particularly needed in lines 1830 and 1860. Line 1810 differentiates between those

persons married and unmarried for printer output. Line 1850 differentiates between the remarried and unremarried, again for printer output. If line 1880 determines that the person is living, then that fact is printed; otherwise, the data is formatted with hyphens and the person is printed as having died, "D.", on the formatted date. Note that the edit subroutine did not format dates with hyphens since only 8 bytes are reserved for each date in the field statement. The edit mode requires that a date such as July 4, 1776, be entered as 07041776 and not as 07-04-1776 or in any other form. Sample Run 11 shows this type of output.

Sample Run 9 cont.

```
? JOHN JAMES
FIRST OR MIDDLE NAME OR INITIAL: 'JOHN JAMES'
JOHN JAMES ARMSTRONG
1) BORN: 021919482 @ AMARILLO, TEXAS
3) MARRIED:      4) TO:
5) @             6) MARITAL STATUS: SINGLE
7) REMARRIED:    8) TO:
9) @            10) MARITAL STATUS:
11) DIED/LIVING: LIVING 12) @ MOBILE, ALABAMA
13) # CHILDREN 0
27) MOTHER: ANNA MARIE GORANSON 28) FATHER: DAVID CLINTON ARMSTRONG
ANY CHANGES TO BE MADE HERE (Y/N)? Y
HOW MANY CHANGES? 1
CHANGE ITEM # ? 1
BIRTH DATE (MMDDYYYY)? 02191949
CONTINUE?
```

Sample Run 10

```
DISPLAY ON VIDEO BY:
( 1 )LAST NAME AT BIRTH
( 2 )FIRST OR MIDDLE NAME OR INITIAL
( 3 )MARRIED LAST NAME
( 4 )ALL ENTRIES
( 5 )LIVING IN YEAR..
( 6 )ALL MENTIONS OF PERSON
CHOICE? 1
DISPLAY ON VIDEO
LAST NAME AT BIRTH
? CASPER
LAST NAME AT BIRTH: 'CASPER'
JAMES CASPER
DONNA LYNN CASPER
JAMES STEVEN CASPER
CONTINUE?
( 1 )EDIT
( 2 )DISPLAY ON VIDEO
( 3 )PRINT ON PRINTER
( 4 )PRINT FAMILY TREE
( 5 )EXIT PROGRAM
```

Sample Run 11

```
CHOICE? 3
(1) NAMES ONLY      (2) WHOLE ENTRY
CHOICE? 1

FIRST OR MIDDLE NAME OR INITIAL: 'JAMES'

3      JOHN JAMES ARMSTRONG
36     JAMES SMITH
94     JAMES CASPER
96     JAMES STEVEN CASPER
117    JAMES ARMSTRONG
228    JAMES TED GIERUCKI
```

Field Subroutines

Besides the date file buffer in line 70, there are two more places where the field statement is used. The subroutine starting with line 1970 apportions the buffer with a set of number of bytes for the various field strings down to the string representation for the ninth child. The fielding is completed in subroutine 2040. It would have been nice to use just one field statement here, but all of the statements together exceeded the maximum line length of 255 characters. Note the different field subroutines called in lines 1300 and 1310 of the edit subroutine. Also, note that

person ID numbers are stored and retrieved from the disk as 2-bytes strings. This conversion from an integer to a string and back again is accomplished through the CVI(A\$) and MKIS(A) file handling functions.

Print Tree Subroutine:

The final main program option begins with line 2110. I added this option last as I did not even envision such a useful choice when I started working on this program. Portions may be difficult to follow and understand since I combined quite a number of lines to reduce memory usage. In fact an early version of the TREE program had 400 lines, later reduced to 250. Note that the program has grown back to 340 lines and occupies about 14,000 bytes.

Starting and ending of the print tree option is done from lines 2130 to 2300. These lines clear the screen and print the name of the person whose file has been accessed. The choice of the descendant or the predecessor output formats is handled in line 2140; and subroutine 3380 lets you select output as the short or long version. (You might want to add a line 2135 to escape from the subroutine without printing a tree.) Lines 2160 and 2250 print the title and heading for the tree. The request for input, "continue", in line 2290 allows you to position the paper for the next tree to be printed. You could change this line to "LPRINTCHR\$(12)" to get a form feed, if desired.

Descendent Tree Subroutine:

Lines 2320 to 2810 collect information for printing a descendent tree. The actual printing is done when subroutine 2830 is called. A review of this subroutine down to line 2420 should help you understand what takes places here and in the similar portions from line 2430 to 2810.

Remember that the six access routes all supply the accessed file number in variable X to the main program subroutine. Line 2340 fields the buffer, fills it, and converts and extracts the numeric values from it. This line sets the tab stop to 0. The first and second spouses of the person are then stored in variables S(1) and S(2) while the number of children of that person is stored in variable OA. The rest of the possible children variables are converted and extracted in subroutine 2040. Then, the ID numbers of the person's children are stored in array C0().

Line 2350 sets up a loop to review the array that holds the spouse ID numbers. The tab stop is reset to 0 since it

Numeric		DUMMYS	dummy string for field- ing buffer
C,C1	choices	F\$	field string for father number
CH	# changes	M\$	field string for mother number
CH ()	item to be changed	MD\$()	marriage dates
X	person ID #	MSS()	marriage statuses
Y, Z	loop counters	NF\$	name first
		NL\$	name last
String		NM\$	name married
A\$	input answer	PB\$	place of birth
BD\$	birthdate	PD\$	place of death/life
BL\$	blanks	PM\$()	marriage places
CH\$, CH\$(), T\$	instructions	S1\$, S2\$	field string for spouse numbers
CS()	field string for chil- dren's numbers	YN\$	yes/no input answer
DD\$	death date/or word "living"		

Table 1 ADDNAME Variables

would have been changed with the calling of subroutine 2370. Variable X is then given the contents of the variable S(S) holding the spouse ID number. If there is a spouse, (that is, if X is greater than 0), then subroutine 2370 is called. Remember that 0 is never used as a person ID number. Thus, if zero is detected, there is no spouse stored. Likewise, this feature is used in the edit mode to input an ID number of 0 when there is either no person ID number to file or no known ID number. If there was a spouse, then that spouse's data is retrieved from the disk in line 2370. Five is added to the tab stop; all spouses of a previously printed person are indented five more than their spouse. Then the spouse is printed with subroutine 2830. The spouse's number of children is stored in variable OB.

The rest of that spouse's data is retrieved with subroutine 2040. Then the children ID numbers are stored in array C1() and subroutine 2380 is called to see if that spouse had children. If there were no children, a return is executed which executes another return at the end of line 2370. This return puts execution back to line 2360 and this process begins on the second spouse. If there had been children of the spouse in line 2380, then line 2390 would have compared the arrays of stored children of the person and the spouse. Finding a match would have called subroutine 2410. This line would have retrieved data on the common children and set the tab stop to 10. Then, that child's data would have been printed and its spouse's ID's, number of children and children ID's would have been stored.

Numeric		SP()	spouse ID #
A	input answer	T	tab stop
AA, AB ...	AL loop counters	X, X1, X3, X7, X8	loop counters
C2, C3	choices	X5	temporary value
CN	# children	Y	temporary value
C()	child ID # or change #		
C0(), C1() ...	children ID storage		
DP	dependent/predecessor choice		
E	exclamation point tab stop		
F	father ID #		
L	line counter		
L1	print @ location		
M	mother ID #		
OA, OB ...	OL # children storage		
P0, P1 ... P5	loop counters		
P0(), P1() ...			
P5()	parent ID storage		
S, S1 ... S5	loop counters		
S(), S1() ...			
S(5)	spouse ID storage		
String			
		B\$	in defined function
		B1\$, B2\$	1 and 2 blanks
		D\$(B\$)	defined function
		DATE\$	formatted date
		DPS	descendent/predecessor heading
		H\$(), H1\$()	headings
		NF\$(), NL\$(),	
		NM\$()	name arrays
		T\$	title
		TP\$	temporary place
		YD\$	year desired

Table 2 TREE Variables

FIRST OR MIDDLE NAME OR INITIAL: 'DAVID C'

DESCENDENTS OF DAVID CLINTON ARMSTRONG

Sample Run 12

PERSON	CHILDREN	GRAND CHILDREN	GRAND CHILDREN	GRAND CHILDREN	GRAND CHILDREN	GRAND CHILDREN
! DAVID CLINTON ARMSTRONG						
! ANNA MARIE GORANSON						
! ! DAVID ARTHUR ARMSTRONG						
! ! MARY NELLE VINCENT						
! ! ! AMANDA SUE ARMSTRONG						
! ! ! JOSEPH DAVID ARMSTRONG						
! ! ! GLENN MICHAEL ARMSTRONG						
! ! ! LYNN BETH HULSEY						
! ! ! BRYAN MARCUS ARMSTRONG						
! ! ! JOHN MATTHEW ARMSTRONG						
! ! JOHN JAMES ARMSTRONG						
! ! KENNETH LEE ARMSTRONG						
! ! CAROL GUNN						
! ! ALICE ANN ARMSTRONG						

GRATEFUL ACKNOWLEDGEMENT IS MADE OF THE WORK OF GLADYS MAE ARMSTRONG
TO COLLECT INFORMATION USED IN COMPILING THIS LISTING.
JOHN JAMES ARMSTRONG 4-15-1979

FIRST OR MIDDLE NAME OR INITIAL: 'MARY NELLE'

DESCENDENTS OF MARY NELLE VINCENT ARMSTRONG

Sample Run 13

PERSON	CHILDREN	GRAND CHILDREN	GRAND CHILDREN	GRAND CHILDREN	GRAND CHILDREN	GRAND CHILDREN
! MARY NELLE VINCENT						
! B. : 04-16-1946 @ BRYAN, TEXAS						
! M. : 12-21-1968 TO DAVID ARTHUR ARMSTRONG @ BRYAN, TEXAS						
! MARRIED						
! LIVING @ PLANO, TEXAS						
! DAVID ARTHUR ARMSTRONG						
! B. : 10-21-1944 @ MINNEAPOLIS, MINNESOTA						
! M. : 12-21-1968 TO MARY NELLE VINCENT @ BRYAN, TEXAS						
! MARRIED						
! LIVING @ PLANO, TEXAS						
! ! AMANDA SUE ARMSTRONG						
! ! B. : 11-16-1973 @ DALLAS, TEXAS						
! ! SINGLE						
! ! LIVING @ PLANO, TEXAS						
! ! JOSEPH DAVID ARMSTRONG						
! ! B. : 01-24-1978 @ PLANO, TEXAS						
! ! SINGLE						
! ! LIVING @ PLANO, TEXAS						

GRATEFUL ACKNOWLEDGEMENT IS MADE OF THE WORK OF GLADYS MAE ARMSTRONG
TO COLLECT INFORMATION USED IN COMPILING THIS LISTING.
JOHN JAMES ARMSTRONG 4-15-1979

Line 2420 would have called subroutine 2430 and the process of checking for the presence of a spouse would have continued. The check for common children takes care of the complication of a couple having both common children and children from another marriage.

Note that provision has been made for only two spouses per person. Thus far, the restriction has been adequate for my family. Note also that the offspring of one set of parents is pursued to its completion or until no further data or levels of subroutines for the treatment of the data exist. Great great great great grandchildren can be printed as they are related in this subroutine. No differentiation is made between natural and adopted children. See Sample Runs 12 and 13.

Printing-of-Tree Subroutine

The printing of the trees whether as descendants or predecessors takes place in subroutine 2830. Line 2850 directs the length of the output as chosen under the start/end subroutine.

Subroutine 3080 causes exclamation pins to be printed in vertical lines to help show the relationships among persons. The depth of these lines from the left margin is determined by tab stop size.

The rightmost blanks of the place strings are stripped away in lines 2930, 2960, 3000 and 3030. This step is very important in formatting the trees. A collection of items exceeding the printer's line buffer length will end up being printed on two lines instead of one, with the second line improperly indented. This process may cause visible execution to cease as the microprocessor collects free string space. Be patient; either execution will continue or the "out of string memory" error message will be displayed.

Predecessor Tree Subroutine

Predecessors of the accessed person are collected through the subroutine beginning with line 3120. This portion of the program pursues the paternal side until no further parentage is detected or until no further subroutines are available for being called. Then the maternal side is tracked to its completion. See Figure 3 for a generalized diagram.

The accessed person's ID number is stored in variable X1 for future use in tracking the maternal side. The parents of the person are stored in Pn(1) and Pn(2) where the expression between the P and the parenthesis is part of the variable name. Note that the variable with

Printing begins with the most distant “father” — for example $P_{n+2}(1)$. Then, the descendent, — for example, $P_{n+1}(1)$ — of that “father” is printed. Next, the most distant “mother” is pursued to the end. Then the father’s side of that “mother” is printed, followed by the “mother”, then the mother’s side of that “mother” is pursued to its end and printed.

Sample Run 15

PREDECESSORS OF SOPHIE TEMPLIN GORANSON

						GREAT	GREAT
						GREAT	GREAT
						GREAT	GREAT
						GREAT	GREAT
						GREAT	GREAT
PERSON	PARENTS	GRAND PARENTS	GRAND PARENTS	GRAND PARENTS	GRAND PARENTS	GRAND PARENTS	GRAND PARENTS
!	!	!	!	!	!	!	!
!	!	!'FATHER' ?					
!	!	B. : ??-??-???? @ ?					
!	!	M. : ??-??-???? TO @ ?					
!	!	MARRIED					
!	!	D. : ??-??-???? @ ?					
!	!	! ? TEMPLIN					
!	!	B. : ??-??-???? @ ?					
!	!	M. : ??-??-???? TO ? EHLERS @ ?					
!	!	MARRIED					
!	!	D. : ??-??-???? @ ?					
!	!	!'MOTHER' ?					
!	!	B. : ??-??-???? @ ?					
!	!	M. : ??-??-???? TO @ ?					
!	!	MARRIED					
!	!	D. : ??-??-???? @ ?					
!	!	! SOPHIE TEMPLIN					
!	!	B. : ??-??-???? @ ?					
!	!	M. : ??-??-???? TO JOHN WILHELM GORANSON @ ?					
!	!	MARRIED					
!	!	D. : ??-??-???? @ DULUTH MINNESOTA					
!	!	!'FATHER' ?					
!	!	B. : ??-??-???? @ ?					
!	!	M. : ??-??-???? TO @ ?					
!	!	MARRIED					
!	!	D. : ??-??-???? @ ?					
!	!	! ? EHLERS					
!	!	B. : ??-??-???? @ GERMANY					
!	!	M. : ??-??-???? TO ? TEMPLIN @ ?					
!	!	MARRIED					
!	!	D. : ??-??-???? @ ?					
!	!	!'MOTHER' ?					
!	!	B. : ??-??-???? @ ?					
!	!	M. : ??-??-???? TO @ ?					
!	!	MARRIED					
!	!	D. : ??-??-???? @ ?					

JOHN JAMES ARMSTRONG 4-15-1979

Sample Run 14

PREDECESSORS OF DAVID SAMPSON ARMSTRONG

PERSON	PARENTS	GRAND PARENTS	GRAND PARENTS	GREAT GREAT GREAT GREAT GREAT	GREAT GREAT GREAT GREAT GREAT	GREAT GREAT GREAT GREAT GREAT
!	!	!	!	!	!	!
!	!	!	!	!'FATHER' ?		
!	!	!	!ROBERT	ARMSTRONG		
!	!	!		!'MOTHER' ?		
!	!	!JAMES	ARMSTRONG			
!	!	!	!	!'FATHER' ?		
!	!	!	!ANN ?			
!	!	!	!	!'MOTHER' ?		
!	!ROBERT	ARMSTRONG				
!	!	!	!'FATHER' ?			
!	!	!SABRA	SAMPSON			
!	!	!	!'MOTHER' ?			
!	!DAVID	SAMPSON	ARMSTRONG			
!	!	!	!'FATHER' ?			
!	!	!MARY	ELIZABETH	MCLLAIN		
!	!	!	!'MOTHER' ?			

JOHN JAMES ARMSTRONG 4-15-1979

Program Listing 1

```

10 ' ---ADDNAME--- JOHN J. ARMSTRONG - MOBILE,AL
20 CLEAR 1000:OPEN"R",1,"FAMILY"
30 DIM C$(13):BL$=STRING$(24,32)
40 CH$=" CHANGE :":CH$(1)="LAST NAME AT BIRTH":CH$(2)="FIRST NAME(5)"
50 CH$(3)="MARRIED LAST NAME":T$=" TO :":
60 C=0:C1=0:CH=0:GOSUB640
70 PRINT"(1) ADD A NAME"(CHR$(10))"(2) CHANGE A NAME"(CHR$(10))"(3) EXIT PROGRAM"
80 INPUT"CHOICE":C:IF C<1 OR C>3 THEN80
90 ON C GOTO110,220,650
100 '
110 ' ROUTINE: ADD-A-NAME
120 '
130 X=LOF(1)+1:GOSUB660:GET 1,X

```


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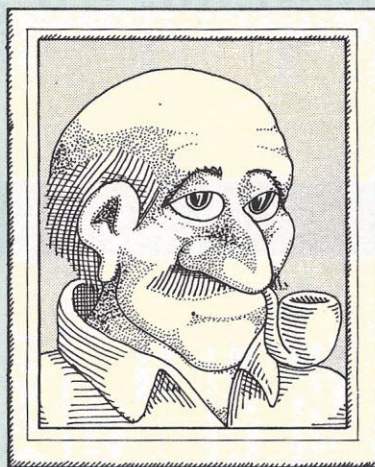
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```

140 GOSUB410:GOSUB440:GOSUB470:PUT 1,X
150 GOSUB510:GET 1,X
160 LSET B0$="????????":LSET PB$="?":LSET MD$(1)=BL$:LSET S1$=MK1$(0):LSET PM$(1)=BL$:LSET MS$(1)="SINGLE"
    :LSET ND$(2)=BL$:LSET S2$=MK1$(0):LSET PM$(2)=BL$:LSET MS$(2)=BL$:LSET DD$="LIVING":LSET PD$="?"
170 PUT 1,X
180 GOSUB560:GET 1,X:FOR Z=10 TO 13:LSET C$(Z)=MK1$(0):LSET M$(Z)=MK1$(0):LSET F$(Z)=MK1$(0)
190 PUT 1,X
200 GOTO60
210 '
220 ' ROUTINE: CHANGE-A-NAME
230 '
240 INPUT"PERSON'S ID # ":"X
250 IF X<1 OR X>LOF(1) PRINT"BETWEEN 1 AND "LOF(1):GOTO240
260 GOSUB600:GET 1,X:CLS:PRINTNF$ "NL$" NM$
270 INPUT"IS THIS THE CORRECT ONE TO CHANGE (Y/N)";YN$
280 IF LEFT$(YN$,1)="Y" THEN290 ELSE600
290 CLS:PRINTNF$ "NL$" NM$
300 FOR Y=1 TO 3:PRINT$(Y)"Y)"CH$(Y):NEXT
310 INPUT"HOW MANY CHANGES";CH:IF CH<0 OR CH>3 THEN310
320 IF CH=0 THEN600
330 FOR Y=1 TO CH
340 PRINT$(Y)"ITEM # ":"INPUTC1
350 IF C1<1 OR C1>3 THEN340
360 CH(Y)=C1:NEXT
370 FOR Y=1 TO CH
380 ON CH(Y) GOSUB410,440,470
390 NEXT
400 PUT 1,X:GOTO60
410 PRINT$(1)
420 IF C=2 PRINT CHANL$T$;
430 INPUT$:LSET NL$=A$:GOSUB630:RETURN
440 PRINT CH$(2)
450 IF C=2 PRINTCHNF$T$;
460 INPUT$:LSET NF$=A$:GOSUB630:RETURN
470 PRINT CH$(3)
480 IF C=2 PRINTCHNMF$T$;
490 INPUT$:LSET NM$=A$:GOSUB630:RETURN
500 '
510 ' SUBROUTINE--FIELD DATA BUFFER TO INITIALIZE DATA
520 '
530 FIELD 1:8 AS B0$,24 AS PB$,8 AS MD$(1),2 AS S1$,24 AS PM$(1),9 AS MS$(1),8 AS ND$(2),2 AS S2$,24 AS PM$(2),
    9 AS MS$(2),8 AS DD$,24 AS PD$,2 AS CN$(2),2 AS C$(1),2 AS C$(2),2 AS C$(3),2 AS C$(4),2 AS C$(5),2 AS C$(6),
    2 AS C$(7),2 AS C$(8),2 AS C$(9)
540 RETURN
550 '
560 ' SUBROUTINE--FIELD DATA BUFFER TO INITIALIZE DATA
570 '
580 FIELD 1:8 AS C$(10),2 AS C$(11),2 AS C$(12),2 AS C$(13),2 AS M$,2 AS F$:RETURN

```



```

390 FOR X1=1 TO LOF(1):Y=INSTR(NF$(X1),NF$):IF Y<0 THEN X=X1:GOSUB1970:GOSUB2040 ELSE410
400 ON C1 GOSUB830,1440,1680,2110:IF L>13 THEN L=0:INPUT"CONTINUE";YN$:PRINT$
410 IF X1<LOF(1) NEXT ELSE INPUT"CONTINUE";YN$:RETURN
420 '
430 ' SUBROUTINE--MARRIED LAST NAME
440 '
450 CLS:L=0:PRINT$(C1):PRINT$(5)H1$(3):INPUTNM$:T$=H1$(3)+": "+NM$+" "
460 IF C1=3 OR C1=4 GOSUB3340 ELSE CLS:PRINT$
470 FOR X1=1 TO LOF(1):IF NM$=NM$(X1) THEN X=X1:GOSUB1970:GOSUB2040 ELSE490
480 ON C1 GOSUB830,1440,1680,2110:IF L>13 THEN L=0:INPUT"CONTINUE";YN$:PRINT$
490 IF X1<LOF(1) NEXT ELSE INPUT"CONTINUE";YN$:RETURN
500 '
510 ' SUBROUTINE--ALL ENTRIES
520 '
530 CLS:L=0:T$=H1$(4)+": ":IF C1=3 OR C1=4 GOSUB3340 ELSE PRINT$
540 FOR X1=1 TO LOF(1):X=X1:GOSUB1970:GOSUB2040
550 ON C1 GOSUB830,1440,1680,2110:IF L>13 THEN L=0:INPUT"CONTINUE";YN$:PRINT$
560 IF X1<LOF(1) NEXT ELSE INPUT"CONTINUE";YN$:RETURN
570 '
580 ' SUBROUTINE--LIVING IN YEAR...
590 '
600 CLS:L=0:PRINT H$(C1):PRINT$(5)H1$(5):INPUT"YYYY";YD$:T$=H1$(5)+": "+YD$+" "
610 IF C1=3 OR C1=4 GOSUB3340 ELSE PRINT$
620 FOR X1=1 TO LOF(1):X=X1:GOSUB1970:GOSUB2040
630 IF VAL(MID$(B0$,5,4))>1500 AND (VAL(MID$(DD$,5,4))>1500 OR LEFT$(DD$,6)="LIVING") THEN640 ELSE660
640 IF YD$=MID$(B0$,5,4) AND (YD$=MID$(DD$,5,4) OR LEFT$(DD$,6)="LIVING") THEN650 ELSE660
650 ON C1 GOSUB830,1440,1680,2110:IF L>13 THEN L=0:INPUT"CONTINUE";YN$:PRINT$
660 IF X1<LOF(1) NEXT ELSE INPUT"CONTINUE";YN$:RETURN
670 '
680 ' SUBROUTINE--ALL MENTIONS OF A PERSON
690 '
700 CLS:PRINT$(C1):X5=0:PRINT H1$(1):PRINT$(5)"OR":PRINT H1$(3):INPUT NL$
710 PRINT H1$(2):INPUTNF$:CLS:FOR X1=1 TO LOF(1):IF NL$(X1)=NL$ OR NM$(X1)=NL$ THEN720 ELSE730
720 Y=INSTR(NF$(X1),NF$):IF Y<0 GOSUB740
730 IF X1<LOF(1) NEXT:GOTO810 ELSE810
740 FOR X2=1 TO LOF(1):X=X2
750 IF X1<>X2 THEN760 ELSE770
760 T$=" "+NF$(X1)+" " "NL$(X1)+" " "NM$(X1)+" " IS LISTED UNDER:":IF C1=3 OR C1=4 GOSUB3340:X5=X1 ELSE PRINT$:X5=X1
770 GOSUB1970:GOSUB2040
780 IF X1=SP(1) OR X1=SP(2) OR X1=C(1) OR X1=C(2) OR X1=C(3) OR X1=C(4) OR X1=C(5) OR X1=C(6) OR X1=C(7)
    OR X1=C(8) OR X1=C(9) OR X1=C(10) OR X1=C(11) OR X1=C(12) OR X1=C(13) OR X1=M OR X1=F THEN790 ELSE800
790 ON C1 GOSUB830,1440,1680,2110:IF L>13 THEN L=0:PRINT$
800 IF X2<LOF(1) NEXT ELSE INPUT"CONTINUE";YN$
810 INPUT"CONTINUE";YN$:RETURN
820 '
830 ' SUBROUTINE--EDIT SELECTION
840 '
850 CLS:PRINT$(NF$(X)) "NL$(X)" NM$(X)
860 PRINT$(64,"1) BORN: "B0$:PRINT$(96,"2) @ "PB$
870 PRINT$(128,"3) MARRIED: "MD$(1):PRINT$(160,"4) TO: "NF$(SP(1)) "NL$(SP(1))
880 PRINT$(192,"5) @ "PM$(1):PRINT$(224,"6) MARITAL STATUS: "MS$(1)

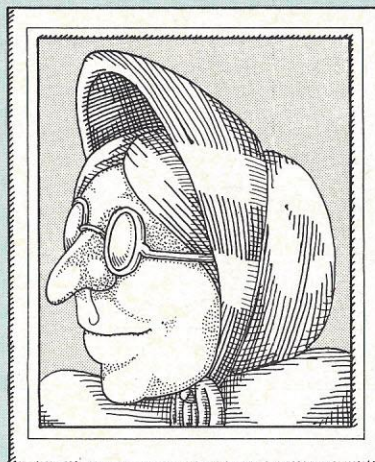
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```

590 /
600 / SUBROUTINE--FIELD DATA BUFFER FOR NAMES
610 /
620 FIELD 1,183 AS DUMMY$,16 AS NL$,24 AS NF$,16 AS NM$:RETURN
630 AF=BL$:RETURN
640 CLS:PRINT"THE ARE "LOF(1)" NAMES ON FILE":RETURN
650 CLS:GOSUB640:CLOSE:PRINT"AND THE FILE HAS BEEN CLOSED.":END

```



Program Listing No. 2

```

10 / --FAMILY TREE PROGRAM-- JOHN J. ARMSTRONG - MOBILE, AL
20 / COMPUTER SYSTEM: TRS-80 32/48 K RAM DISK PRINTER
30 DEFINT A-Z: CLEAR 8000: B1$="" : B2$="" : OPEN"R",1,"FAMILY:1"
40 DEFFN D$(B$)=LEFT$(B$,2)+"-"+MID$(B$,3,2)+"-"+MID$(B$,5)
50 DIM NL$(LOF(1)),NF$(LOF(1)),NM$(LOF(1)),C$(13),C(28)
60 FOR X=1 TO LOF(1)
70 FIELD 1,183 AS DUMMY$,16 AS NL$,24 AS NF$,16 AS NM$
80 GET 1,X
90 V=INSTR(NL$,B1$):GOSUB3350:NL$(X)=LEFT$(NL$,V):V=INSTR(NF$,B2$):GOSUB3350:NF$(X)=LEFT$(NF$,V)
100 V=INSTR(NM$,B1$):GOSUB3350:NM$(X)=LEFT$(NM$,V)
110 PRINTX" NF$(X)" NL$(X)" NM$(X)
120 NEXT
130 H$(1)="EDIT":H$(2)="DISPLAY ON VIDEO":H$(3)="PRINT ON PRINTER"
140 H$(4)="PRINT FAMILY TREE":H$(5)="EXIT PROGRAM"
150 H$(1)=""LAST NAME AT BIRTH":H$(2)=""FIRST OR MIDDLE NAME OR INITIAL"
160 H$(3)=""MARRIED LAST NAME":H$(4)=""ALL ENTRIES"
170 H$(5)=""LIVING IN YEAR...":H$(6)=""ALL MENTIONS OF PERSON"
180 C1=0:C2=0:C3=0:CLS:FOR X=1 TO 5:PRINT"("X)"H$(X):NEXT
190 INPUT"CHOICE":C1:IF C1<1 OR C1>5 THEN190
200 IF C1=5 GOTO3400 ELSE IF C1=1 OR C1=4 THEN220
210 GOSUB3380
220 PRINTH$(C1):" BY:"
230 FOR X=1 TO 6:PRINT"("X)"H$(X):NEXT
240 INPUT"CHOICE":C3:IF C3<1 OR C3>6 THEN240 ELSE250
250 ON C3 GOSUB270,350,430,510,580,680:GOTO180
260 /
270 / SUBROUTINE--LAST NAME AT BIRTH
280 /
290 CLS:L=0:PRINTH$(C1):PRINTTAB(5)H$(1):INPUTNL$:T$=NL$(1)+": "NL$+"
300 IF C1=3 OR C1=4 GOSUB3340 ELSE CLS:PRINTT$
310 FOR X1=1 TO LOF(1):IF NL$=NL$(X1) THEN X=X1:GOSUB1970:GOSUB2040 ELSE330
320 ON C1 GOSUB830,1440,1680,2110:IF L>13 THEN L=0:INPUT"CONTINUE":YN$:PRINTT$
330 IF X1<LOF(1) NEXT ELSE INPUT"CONTINUE":YN$:RETURN
340 /
350 / SUBROUTINE--FIRST OR MIDDLE NAME OR INITIAL
360 /
370 CLS:L=0:PRINTH$(C1):PRINTTAB(5)H$(2):INPUTNF$:T$=NF$(2)+": "NF$+"
380 IF C1=3 OR C1=4 GOSUB3340 ELSE CLS:PRINTT$

```

```

890 PRINT@256,"7) REMARRIED: "MD$(2):PRINT@288,"8) TO: "NF$(SP(2))" NL$(SP(2))
900 PRINT@320,"9) @ "PM$(2):PRINT@352,"10) MARITAL STATUS: "MS$(2)
910 PRINT@384,"11) DIED/LIVING: "DD$:PRINT@416,"12) @ "PD$
920 PRINT@448,"13) # CHILDREN"CN
930 L1=480:IF CN=0 THEN950 ELSE FOR X2=1 TO CN:X4=C(X2):L1=480+(X2-1)*32
940 PRINT@L1,MID$(STR$(X2+13),2)" "NF$(X4)" NL$(X4):NEXT:L1=L1+32
950 PRINT@L1-1," 27) MOTHER: "NF$(M)" NL$(M):PRINT@L1+3L," 28) FATHER: "NF$(F)" NL$(F)
960 PRINT@896,":INPUT"ANY CHANGES TO BE MADE HERE (Y/N)":YN$:GOSUB1370
970 IF LEFT$(YN$,1)="Y" GOSUB1370:GOSUB990:RETURN ELSECLS:RETURN
980 /
990 / SUBROUTINE--EDIT DATA
1000 /
1010 GOSUB1370:INPUT"HOW MANY CHANGES":CH:IF CH=0 RETURN
1020 IF CH<1 OR CH>28 PRINTCH" IS AN INCORRECT NUMBER OF CHANGES":GOTO1010
1030 GOSUB1370:FOR X3=1 TO CH
1040 INPUT"CHANGE ITEM # ":C(X3):IF C(X3)<1 OR C(X3)>28 PRINTC(X3)" IS AN INVALID ITEM # ":GOSUB1370:GOTO1040
1050 GOSUB1370:NEXT:GOSUB1370
1060 FOR X3=1 TO CH
1070 ON C(X3)GOSUB1090,1100,1110,1120,1130,1140,1150,1160,1170,1180,1190,1200,1210,1220,1230,1240,1250,1260,1270,
1280,1290,1300,1310,1320,1330,1340,1350,1360
1080 NEXT:RETURN
1090 GOSUB1970:INPUT"BIRTH DATE (MMDDYYYY)":A$:LSET B0$=A$:PUT 1,X:GOTO1370
1100 GOSUB1970:LINEINPUT"BIRTH PLACE? ":A$:LSET P0$=A$:PUT 1,X:GOTO1370
1110 GOSUB1970:INPUT"DATE OF MARRIAGE (MMDDYYYY)":A$:LSET MD$(1)=A$:PUT 1,X:GOTO1370
1120 GOSUB1970:PRINT"SPOUSE ID NUMBER ":GOSUB1380:LSET S1$=MKI$(A):PUT 1,X:GOTO1370
1130 GOSUB1970:LINEINPUT"MARRIED @ ? ":A$:LSET PM$(1)=A$:PUT 1,X:GOTO1370
1140 GOSUB1970:INPUT"MARITAL STATUS ":A$:LSET MS$(1)=A$:PUT 1,X:GOTO1370
1150 GOSUB1970:INPUT"DATE OF SECOND MARRIAGE (MMDDYYYY)":A$:LSET MD$(2)=A$:PUT 1,X:GOTO1370
1160 GOSUB1970:PRINT"SECOND SPOUSE ID NUMBER ":GOSUB1380:LSET S2$=MKI$(A):PUT 1,X:GOTO1370
1170 GOSUB1970:LINEINPUT"REARRIED @ ? ":A$:LSET PM$(2)=A$:PUT 1,X:GOTO1370
1180 GOSUB1970:INPUT"MARITAL STATUS ":A$:LSET MS$(2)=A$:PUT 1,X:GOTO1370
1190 GOSUB1970:INPUT"LIIVING" OR DATE OF DEATH (MMDDYYYY)":A$:LSET DD$=A$:PUT 1,X:GOTO1370
1200 GOSUB1970:LINEINPUT"PLACE OF DEATH OR LIIVING ? ":A$:LSET PD$=A$:PUT 1,X:GOTO1370
1210 GOSUB1970:INPUT"NUMBER OF CHILDREN ":CN:LSET CN$=MKI$(CN):PUT 1,X:GOTO1370
1220 GOSUB1970:PRINT"CHILD #1 ID NUMBER ":GOSUB1380:LSET C$(1)=MKI$(A):PUT 1,X:GOTO1370
1230 GOSUB1970:PRINT"CHILD #2 ID NUMBER ":GOSUB1380:LSET C$(2)=MKI$(A):PUT 1,X:GOTO1370
1240 GOSUB1970:PRINT"CHILD #3 ID NUMBER ":GOSUB1380:LSET C$(3)=MKI$(A):PUT 1,X:GOTO1370
1250 GOSUB1970:PRINT"CHILD #4 ID NUMBER ":GOSUB1380:LSET C$(4)=MKI$(A):PUT 1,X:GOTO1370
1260 GOSUB1970:PRINT"CHILD #5 ID NUMBER ":GOSUB1380:LSET C$(5)=MKI$(A):PUT 1,X:GOTO1370
1270 GOSUB1970:PRINT"CHILD #6 ID NUMBER ":GOSUB1380:LSET C$(6)=MKI$(A):PUT 1,X:GOTO1370
1280 GOSUB1970:PRINT"CHILD #7 ID NUMBER ":GOSUB1380:LSET C$(7)=MKI$(A):PUT 1,X:GOTO1370
1290 GOSUB1970:PRINT"CHILD #8 ID NUMBER ":GOSUB1380:LSET C$(8)=MKI$(A):PUT 1,X:GOTO1370
1300 GOSUB1970:PRINT"CHILD #9 ID NUMBER ":GOSUB1380:LSET C$(9)=MKI$(A):PUT 1,X:GOTO1370
1310 GOSUB2040:PRINT"CHILD #10 ID NUMBER ":GOSUB1380:LSET C$(10)=MKI$(A):PUT 1,X:GOTO1370
1320 GOSUB2040:PRINT"CHILD #11 ID NUMBER ":GOSUB1380:LSET C$(11)=MKI$(A):PUT 1,X:GOTO1370
1330 GOSUB2040:PRINT"CHILD #12 ID NUMBER ":GOSUB1380:LSET C$(12)=MKI$(A):PUT 1,X:GOTO1370
1340 GOSUB2040:PRINT"CHILD #13 ID NUMBER ":GOSUB1380:LSET C$(13)=MKI$(A):PUT 1,X:GOTO1370
1350 GOSUB2040:PRINT"MOTHER'S ID NUMBER ":GOSUB1380:LSET M$=MKI$(A):PUT 1,X:GOTO1370
1360 GOSUB2040:PRINT"FATHER'S ID NUMBER ":GOSUB1380:LSET F$=MKI$(A):PUT 1,X:GOTO1370
1370 A=0:A$="" :PRINT@896,CHR$(29):CHR$(30):CHR$(29):RETURN
1380 V=P0$(0)

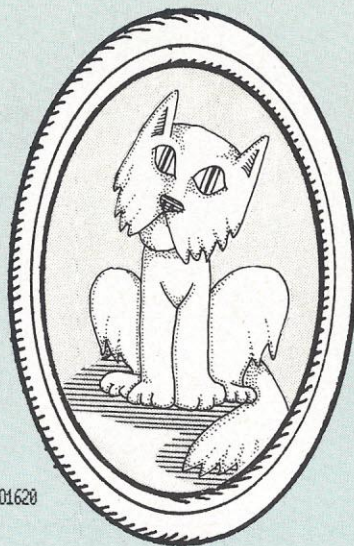
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```

1390 INPUT
1400 IF A0=0 AND A<=OF(1) RETURN
1410 PRINTA" IS AN INVALID PERSON ID # ";
1420 PRINT@B96+Y,CHR$(30);:PRINT@B96+Y;;:GOTO1390
1430 '
1440 ' SUBROUTINE--OPTION TO DISPLAY ON VIDEO
1450 '
1460 ON C2 GOSUB1480,1520:RETURN
1470 '
1480 ' SUBROUTINE--DISPLAY NAMES ONLY
1490 '
1500 PRINTAB(5)NF$(X)" NL$(X)" NM$(X):L=L+1:RETURN
1510 '
1520 ' SUBROUTINE--DISPLAY WHOLE ENTRY
1530 '
1540 PRINT@0,NF$(X)" NL$(X)" NM$(X):GOSUB3300
1550 PRINT@64,"B. : "DATE$:PRINT@96,"@ "PB$:GOSUB3310
1560 PRINT@128,"M. : "DATE$:PRINT@160,"TO "NF$(SP(1))" NL$(SP(1))
1570 PRINT@192,"@ "PM$(1):PRINT@224,MS$(1):GOSUB3320
1580 PRINT@256,"RM. : "DATE$:PRINT@288,"TO "NF$(SP(2))" NL$(SP(2))
1590 PRINT@320,"@ "PM$(2):PRINT@352,MS$(2)
1600 IF LEFT$(D0$,6)="LIVING" THEN PRINT@384,D0$:PRINT@416,"@ "PD$:GOTO1620
1610 GOSUB3330:PRINT@384,"D. : "DATE$:PRINT@416,"@ "PD$
1620 PRINT@448,"# CHILDREN:"CN
1630 L1=480:IF CN=0 THEN1650 ELSE FOR X3=1 TO CN:X4=C(X3):L1=480+(X3-1)*32
1640 PRINT@L1,MID$(STR$(X3),2)"NF$(X4)" NL$(X4):NEXT L1=L1+32
1650 PRINT@L1-1,"MOTHER: "NF$(M)" NL$(M):PRINT@L1+31,"FATHER: "NF$(F)" NL$(F)
1660 PRINT@B96,:INPUT"CONTINUE";YH$:CLS:RETURN
1670 '
1680 ' SUBROUTINE--OPTION TO PRINT ON PRINTER
1690 '
1700 ON C2 GOSUB1720,1760:RETURN
1710 '
1720 ' SUBROUTINE--PRINT NAMES ONLY
1730 '
1740 LPRINTX,NF$(X)" NL$(X)" NM$(X):RETURN
1750 '
1760 ' SUBROUTINE--PRINT WHOLE ENTRY
1770 '
1780 LPRINTNF$(X)" NL$(X)" NM$(X):TP$=PB$:GOSUB3360:PB$=TP$
1790 GOSUB3300:LPRINTTAB(5)"B. : "DATE$" @ "PB$
1800 TP$=PM$(1):GOSUB3360:PM$(1)=TP$
1810 IF VAL(MD$(1))>0 OR LEFT$(MD$(1),1)="?":GOSUB3310:GOTO1830
1820 LPRINTTAB(5)MS$(1):GOTO1870
1830 LPRINTTAB(5)"M. : "DATE$" TO "NF$(SP(1))" NL$(SP(1))" @ "PM$(1)" MS$(1)
1840 TP$=PM$(2):GOSUB3360:PM$(2)=TP$
1850 IF VAL(MD$(2))>0 OR LEFT$(MD$(2),1)="?":GOSUB3320 ELSE1870
1860 LPRINTTAB(5)"RM. : "DATE$" TO "NF$(SP(2))" NL$(SP(2))" @ "PM$(2)" MS$(2)
1870 TP$=PD$:GOSUB3360:PD$=TP$
1880 IF LEFT$(D0$,6)="LIVING" THEN LPRINTTAB(5)D0$" @ "PD$:GOTO1900
1890 GOSUB3330:LPRINTTAB(5)"D. : "DATE$" @ "PD$
1900 IF CN=0 THEN1930

```



```

2390 FOR AH=1 TO OA:FOR AB=1 TO OB:IF C0(A0)=C1(AB) AND C0(A0)>0 THEN X=C0(A0):GOSUB2410
2400 NEXT AB:NEXT AH:RETURN
2410 GOSUB1970:T=10:GOSUB2830:S1(1)=SP(1):S1(2)=SP(2):OC=CN:GOSUB2040:FOR AC=1 TO OC:C2(AC)=C(AC):NEXT
2420 GOSUB2430:RETURN
2430 FOR S1=1 TO 2:X=S1(S1):IF X=0 GOSUB2450
2440 NEXT S1:RETURN
2450 GOSUB1970:T=T+5:GOSUB2830:OC=CN:GOSUB2040:FOR AD=1 TO OD:C3(AD)=C(AD):NEXT:GOSUB2460:RETURN
2460 IF OD=0 THEN T=10:RETURN
2470 FOR AD=1 TO OD:FOR AE=1 TO OE:IF C2(AC)=C3(AD) AND C2(AC)>0 THEN X=C2(AC):GOSUB2490
2480 NEXT AD:NEXT AE:T=10:RETURN
2490 GOSUB1970:T=20:GOSUB2830:S2(1)=SP(1):S2(2)=SP(2):OE=CN:GOSUB2040:FOR AE=1 TO OE:C4(AE)=C(AE):NEXT
2500 GOSUB2510:RETURN
2510 FOR S2=1 TO 2:X=S2(S2):IF X=0 GOSUB2530
2520 NEXT S2:RETURN
2530 GOSUB1970:T=T+5:GOSUB2830:OF=CN:GOSUB2040:FOR AF=1 TO OF:C5(AF)=C(AF):NEXT:GOSUB2540:RETURN
2540 IF OF=0 THEN T=20:RETURN
2550 FOR AE=1 TO OE:FOR AF=1 TO OF:IF C4(AE)=C5(AF) AND C4(AE)>0 THEN X=C4(AE):GOSUB2570
2560 NEXT AF:NEXT AE:T=20:RETURN
2570 GOSUB1970:T=30:GOSUB2830:S3(1)=SP(1):S3(2)=SP(2):OG=CN:GOSUB2040:FOR AG=1 TO OG:C6(AG)=C(AG):NEXT
2580 GOSUB2590:RETURN
2590 FOR S3=1 TO 2:X=S3(S3):IF X=0 GOSUB2610
2600 NEXT S3:RETURN
2610 GOSUB1970:T=T+5:GOSUB2830:OH=CN:GOSUB2040:FOR AH=1 TO OH:C7(AH)=C(AH):NEXT:GOSUB2620:RETURN
2620 IF OH=0 THEN T=30:RETURN
2630 FOR AG=1 TO OG:FOR AH=1 TO OH:IF C6(AG)=C7(AH) AND C6(AG)>0 THEN X=C6(AG):GOSUB2650
2640 NEXT AH:NEXT AG:T=30:RETURN
2650 GOSUB1970:T=40:GOSUB2830:S4(1)=SP(1):S4(2)=SP(2):OI=CN:GOSUB2040:FOR AI=1 TO OI:C8(AI)=C(AI):NEXT
2660 GOSUB2670:RETURN
2670 FOR S4=1 TO 2:X=S4(S4):IF X=0 GOSUB2690
2680 NEXT S4:RETURN
2690 GOSUB1970:T=T+5:GOSUB2830:OJ=CN:GOSUB2040:FOR AJ=1 TO OJ:C9(AJ)=C(AJ):NEXT:GOSUB2700:RETURN
2700 IF OJ=0 THEN T=40:RETURN
2710 FOR AI=1 TO OI:FOR AJ=1 TO OJ:IF C8(AI)=C9(AJ) AND C8(AI)>0 THEN X=C8(AI):GOSUB2730
2720 NEXT AJ:NEXT AI:T=40:RETURN
2730 GOSUB1970:T=50:GOSUB2830:S5(1)=SP(1):S5(2)=SP(2):OK=CN:GOSUB2040:FOR AK=1 TO OK:CA(AK)=C(AK):NEXT
2740 GOSUB2750:RETURN
2750 FOR S5=1 TO 2:X=S5(S5):IF X=0 GOSUB2770
2760 NEXT S5:RETURN
2770 GOSUB1970:T=T+5:GOSUB2830:OL=CN:GOSUB2040:FOR AL=1 TO OL:CB(AL)=C(AL):NEXT:GOSUB2780:RETURN
2780 IF OL=0 THEN T=50:RETURN
2790 FOR AK=1 TO OK:FOR AL=1 TO OL:IF CA(AK)=CB(AL) AND CA(AK)>0 THEN X=CA(AK):GOSUB2810
2800 NEXT AL:NEXT AK:T=50:RETURN
2810 GOSUB1970:T=60:GOSUB2040:GOSUB2830:RETURN
2820 '
2830 ' SUBROUTINE--PRINT TREE
2840 '
2850 ON C2 GOSUB2870,2910:RETURN
2860 '
2870 ' SUBROUTINE--PRINT NAMES ONLY IN TREE FORM
2880 '
2890 GOSUB3080:LPRINTTAB(T)NF$(X)" NL$(X):RETURN

```



```

1910 LPRINTTAB(5)*" CHILDREN:"CN
1920 FOR X3=1 TO CN:X4=C(X3):LPRINTTAB(10)*X3)*"NF$(X4)" "NL$(X4):NEXT
1930 LPRINTTAB(5)*"MOTHER: "NF$(M)" "NL$(M)
1940 LPRINTTAB(5)*"FATHER: "NF$(F)" "NL$(F)
1950 LPRINT " ":RETURN
1960 '
1970 ' SUBROUTINE--FIELD DATA BUFFER
1980 '
1990 FIELD 1,8 AS B0$,24 AS PB$,8 AS MD$,2 AS S1$,24 AS PM$(1),9 AS M5$(1),8 AS MD$(2),
2 AS S2$,24 AS PM$(2),9 AS M5$(2),8 AS DD$,24 AS PD$,2 AS CN$,2 AS C$(1),2 AS C$(2),2 AS C$(3),2 AS C$(4),
2 AS C$(5),2 AS C$(6),2 AS C$(7),2 AS C$(8),2 AS C$(9)
2000 GET 1,X
2010 SP(1)=CVI(S1$):SP(2)=CVI(S2$):CN=CVI(CN$):C(1)=CVI(C$(1)):C(2)=CVI(C$(2)):C(3)=CVI(C$(3)):C(4)=
CVI(C$(4)):C(5)=CVI(C$(5)):C(6)=CVI(C$(6)):C(7)=CVI(C$(7)):C(8)=CVI(C$(8)):C(9)=CVI(C$(9))
2020 RETURN
2030 '
2040 ' SUBROUTINE--FIELD DATA BUFFER
2050 '
2060 FIELD 1,171 AS DUMMY$,2 AS C$(10),2 AS C$(11),2 AS C$(12),2 AS C$(13),2 AS M$,2 AS F$
2070 GET 1,X
2080 C(10)=CVI(C$(10)):C(11)=CVI(C$(11)):C(12)=CVI(C$(12)):C(13)=CVI(C$(13)):M=CVI(M$):F=CVI(F$)
2090 RETURN
2100 '
2110 ' SUBROUTINE--START/END TREE
2120 '
2130 CLS:PRINT@,NF$(X)" "NL$(X)" "NM$(X)
2140 PRINT@64,"1) DESCENDENTS 2) PREDECESSORS":INPUT"CHOICE";DP:IF DP<1 AND DP>2 THEN2140
2150 GOSUB3380
2160 IF DP=1 THEN DP$="DESCENDENTS OF ":CP$="CHILDREN" ELSE DP$="PREDECESSORS OF ":CP$="PARENTS"
2170 LPRINTTAB(15)*DP$NF$(X)" "NL$(X)" "NM$(X):LPRINT " ":LPRINT " "
2180 FOR X7=60 TO 30 STEP -10
2190 FOR X8=X7 TO 60 STEP 10
2200 LPRINTTAB(X8)*"GREAT";
2210 NEXT:LPRINT " ":NEXT
2220 FOR X7=20 TO 60 STEP 10:LPRINTTAB(X7)*"GRAND":NEXT:LPRINT " "
2230 LPRINTTAB(0)*"PERSON";
2240 FOR X7=10 TO 60 STEP 10:LPRINTTAB(X7)*CP$:NEXT:LPRINT " "
2250 T=60:GOSUB3080:LPRINT " "
2260 ON DP GOSUB2320,3120
2270 LPRINT " ":LPRINT"GRATEFUL ACKNOWLEDGEMENT IS MADE OF THE WORK OF GLADYS MAE ARMSTRONG"
2280 LPRINT"TO COLLECT INFORMATION USED IN COMPILING THIS LISTING."
2290 LPRINTTAB(40)*"JOHN JAMES ARMSTRONG 4-15-1979":LPRINT " ":INPUT"CONTINUE";YN$
2300 RETURN
2310 '
2320 ' SUBROUTINE--COLLECT INFO FOR DESCENDENTS TREE
2330 '
2340 GOSUB1970:T=0:GOSUB2830:S(1)=SP(1):S(2)=SP(2):OA=CN:GOSUB2040:FOR AA=1 TO OA:O8(AA)=C(AA):NEXT
2350 FOR S=1 TO 2:T=0:X=S(5):IF X<0 GOSUB2370
2360 NEXT S:RETURN
2370 GOSUB1970:T=T+5:GOSUB2830:O6=CN:GOSUB2040:FOR AB=1TOO6:C1(AB)=C(AB):NEXT:GOSUB2380:RETURN
2380 IF O6=0 THEN T=0:RETURN

```

```

2900 '
2910 ' SUBROUTINE--PRINT WHOLE ENTRY IN TREE FORM
2920 '
2930 GOSUB3080:LPRINTTAB(7)*NF$(X)" "NL$(X):TP$=PB$:GOSUB3360:PB$=TP$:GOSUB3380
2940 GOSUB3080:LPRINTSTRING$(5,32)*B: "DATE$" @ "PB$
2950 IF VAL(MD$(1))>0 OR LEFT$(MD$(1),1)="? " GOSUB3310:GOTO2960 ELSE2980
2960 TP$=PM$(1):GOSUB3360:PM$(1)=TP$
2970 GOSUB3080:LPRINTSTRING$(5,32)*M: "DATE$" TO "NF$(SP(1))" "NL$(SP(1))" @ "PM$(1)
2980 GOSUB3080:LPRINTSTRING$(5,32)*M$(1)
2990 IF VAL(MD$(2))>0 OR LEFT$(MD$(2),1)="? " GOSUB3320:GOTO3000 ELSE3030
3000 TP$=PM$(2):GOSUB3360:PM$(2)=TP$
3010 GOSUB3080:LPRINTSTRING$(5,32)*M: "DATE$" TO "NF$(SP(2))" "NL$(SP(2))" @ "PM$(2)
3020 GOSUB3080:LPRINTSTRING$(5,32)*M$(2)
3030 TP$=PD$:GOSUB3360:PD$=TP$
3040 GOSUB3080:IF LEFT$(DD$,6)="LIVING" LPRINTSTRING$(5,32)*DD$ @ "PD$:GOTO3060
3050 GOSUB3330:LPRINTSTRING$(5,32)*D: "DATE$" @ "PD$
3060 RETURN
3070 '
3080 ' SUBROUTINE--PRINT EXCLAMATION POINTS
3090 '
3100 FOR E=0 TO T STEP 10:LPRINTTAB(E)*"!":NEXT:RETURN
3110 '
3120 ' SUBROUTINE--COLLECT INFO FOR PREDECESSORS TREE
3130 '
3140 GOSUB1970:GOSUB2040:X1=X:GOSUB3150:RETURN
3150 P0(1)=F:P0(2)=M:FOR P0=1 TO 2:X=P0(P0):IF X<0 GOSUB3170
3160 T=0:X=X1:IF P0=1 GOSUB1970:GOSUB2830:NEXT:RETURN ELSE RETURN
3170 GOSUB1970:GOSUB2040:P1(1)=F:P1(2)=M:FOR P1=1 TO 2:X=P1(P1):IF X<0 GOSUB3190
3180 T=10:X=P0(P0):IF P1=1 GOSUB1970:GOSUB2830:NEXT:RETURN ELSE RETURN
3190 GOSUB1970:GOSUB2040:P2(1)=F:P2(2)=M:FOR P2=1 TO 2:X=P2(P2):IF X<0 GOSUB3210
3200 T=20:X=P1(P1):IF P2=1 GOSUB1970:GOSUB2830:NEXT:RETURN ELSE RETURN
3210 GOSUB1970:GOSUB2040:P3(1)=F:P3(2)=M:FOR P3=1 TO 2:X=P3(P3):IF X<0 GOSUB3230
3220 T=30:X=P2(P2):IF P3=1 GOSUB1970:GOSUB2830:NEXT:RETURN ELSE RETURN
3230 GOSUB1970:GOSUB2040:P4(1)=F:P4(2)=M:FOR P4=1 TO 2:X=P4(P4):IF X<0 GOSUB3250
3240 T=40:X=P3(P3):IF P4=1GOSUB 1970:GOSUB2830:NEXT:RETURN ELSE RETURN
3250 GOSUB1970:GOSUB2040:P5(1)=F:P5(2)=M:FOR P5=1 TO 2:X=P5(P5):IF X<0 GOSUB3270
3260 T=50:X=P4(P4):IF P5=1 GOSUB1970:GOSUB2830:NEXT:RETURN ELSE RETURN
3270 GOSUB1970:GOSUB2040:P6(1)=F:P6(2)=M:FOR P6=1 TO 2:X=P6(P6):IF X<0 GOSUB3290
3280 T=60:X=P5(P5):IF P6=1 GOSUB1970:GOSUB2830:NEXT:RETURN ELSE RETURN
3290 RETURN
3300 DATE$=FND$(B0$):RETURN
3310 DATE$=FND$(MD$(1)):RETURN
3320 DATE$=FND$(MD$(2)):RETURN
3330 DATE$=FND$(DD$):RETURN
3340 LPRINT " ":LPRINTT$:LPRINT " ":RETURN
3350 IF Y=1 THEN Y=Y-1:RETURN ELSERETURN
3360 Y=INSTR(TP$,B2$):IF Y=0 THEN Y=24
3370 TP$=LEFT$(TP$,Y):RETURN
3380 PRINT*(1) NAMES ONLY (2) WHOLE ENTRY":INPUT"CHOICE";C2
3390 IF C2=1 OR C2=2 RETURN ELSE3380
3400 CLOSE:CLS:PRINT"FILE HAS BEEN CLOSED & PROGRAM ENDED. ":END

```


EXAM

BLUE BOOK

Name Stewart Fisher
Section A5045-D2
Date Sept 23, 1979

A-
9881072
47
44

By Loyd Bulmer
and Primero
Consultants Inc.

Teachers working in classrooms outfitted with one or more microprocessor terminals can use the following program when giving examinations.

The program is divided into two separate parts: questions and answers. To eliminate cheating, teachers give students only the questions part. With this program students are permitted to review their answers and make changes before submitting results for marking.

The program assumes the teacher has formulated the questions in advance, but it does not prevent formulating during the re-writing of the program. The number of questions can be written into line 10 either before or after the exam is completely formulated.

The program was written in the form of a "blank check" so that only mini-

mum editing is needed to prepare a new test.

In line 10 of the examination portion, N reflects the number of questions in the exam. Line 30 represents the subject of the exam. Line 40 is the date of the exam. Line 100 and following are the questions, represented by the array Q\$(N). A student's answers are spun into the array SA\$(N). The correct answers are in the array CA\$(N) in the marking portion. The marking and percentage calculations are self-explanatory. The review function in the marking program allows the instructor to check the student's accuracy and thus permits a guide for supplementary instruction in those areas where the student is weak.

To keep the printed sample program short, only three questions and answers

were formulated. The program is easily adaptable to examinations in History, Geography, Science, Health and Literature. However, it would be very difficult to use in foreign language testing, music or examinations requiring an essay.

While the program is written in Radio Shack Level-II BASIC and requires 16K RAM, it can be modified for Level I by couching the questions into numeric answers: "... enter 1 for yes, 2 for no". Hard-copy printouts on the marking program can be obtained by replacing the "PRINT" command with "LPRINT" in lines 440, 450, 500, 510, 540 and 999. This program is easily translated into other computer languages.

Marking the exam is fairly easy. The instructor can note the tape cassette index counter at the end of the copying of the examination program for distribution to the students. When the students' cassettes are returned for marking, the teacher merely inserts the cassette and re-winds it to the index-counter number where the answer/data starts. To prevent students from entering another student's name as D1\$, a teacher can label the cassettes with numbers previously assigned to classroom seats.

Line 530 prevents the student from fooling around by saying "YEAH" instead of "YES". A "NOPE" or "NAW" is ignored since the line accepts and acts only upon a positive affirmation. In Spanish-speaking areas, line 530 could be amended to accept either a "Y" for YES, YEA, YEAH or an "S" for SI by:

```
530 IF LEFT$(Z$,1) = "Y" OR LEFT$(Z$,1) = "S" INPUT "NEW ANSWER" etc.
```

Similarly, line 440 could be restructured to test the first letter of the inputted string as "N" for NO, NAW, NOPE, NEVER and the Spanish NON.

In the marking portion, special attention should be paid to lines 402 and 404, leading to the subroutines in line 600 and 700. The 600 series allows a latitude in the answer to be considered correct, and two forms of answers. The latitude in the written example is that while the "correct" answer is 22,000,000, an answer between 20,000,000 and 24,000,000 is deemed to be correct. Line 610 permits an answer of 22 million (spelled out instead of the numeric) as well as a latitude of between 20 million and 24 million (with or without a dash between the figures and the word).

The 700 series provides for alternative answers. In this case, "TRUDEAU" or "PIERRE TRUDEAU" are equally correct. A third option of "PIERRE ELLIOTT TRUDEAU" could easily be added.

When it's time to write another test, changes in the examination section are required only in line 10, the number of questions; line 30 for the title of the test; line 40 for the date of the test; and line 100, etc., for the formulation of the questions.

Changes in the marking section are required only in lines 90 and following for the correct answers. If latitude is required, then adjustments are needed in lines 402 and 404 to specify the questions where latitude is to be granted, and the subroutines starting with lines 600 and 700 to define the latitude.

The two programs were written in open style for ease in reading, but byte-conscious programmers can eliminate most spaces in the lines for a more compact listing.

Depending on the number of questions and their length, and the length of the expected answers, the CLEAR command in line 10 of both programs may have to be adjusted.

Of course, you should pre-test the programs before submitting them to students. □

Variable Table

N: number of question in the examination

S\$: subject of the examination

D2\$: date of the examination

D1\$: student's name

Q\$(n): question with its number in the array

SA\$(n): student's answer to the question numbered n in the array

CA\$(n): correct answer to the question numbered n in the array

S: score of correct answers

PC: percentage of correct answers

Sample Run

```
STUDENT'S NAME ? LOYD
QUESTION # 1
IN WHAT YEAR WAS CANADA FOUNDED?
MY ANSWER: ? 1867
QUESTION # 2
WHAT IS CANADA'S POPULATION?
MY ANSWER: ? 22 MILLION
QUESTION # 3
WHO IS CANADA'S PRIME MINISTER?
MY ANSWER: ? LOUIS ST LAURENT
DO YOU WANT TO REVIEW YOUR ANSWERS ? YES
QUESTION # 1
IN WHAT YEAR WAS CANADA FOUNDED?
MY ANSWER: 1867
DO YOU WANT TO CHANGE THIS ANSWER ? NO
QUESTION # 2
WHAT IS CANADA'S POPULATION?
MY ANSWER: 22 MILLION
DO YOU WANT TO CHANGE THIS ANSWER ? NO
QUESTION # 3
WHO IS CANADA'S PRIME MINISTER?
MY ANSWER: LOUIS ST. LAURENT
DO YOU WANT TO CHANGE THIS ANSWER ? YES
NEW ANSWER ? LESTER PEARSON
```

```
WHEN CASSETTE READY, PRESS 'ENTER' KEY ?
THIS COMPLETES TODAY'S EXAMINATION.
PLEASE RETURN THE CASSETTE TO THE TEACHER.
THANK YOU.
```

```
WHEN CASSETTE READY TO INPUT DATA, PRESS 'ENTER'
KEY ?
FINISHED WITH CASSETTE
FINISHED WITH CASSETTE
LOYD'S SCORE ON CANADIAN SOCIAL STUDIES
EXAMINATION ON JUNE 15, 1979 WAS 66.6667 %
```

```
DO YOU WANT TO REVIEW THE QUESTIONS AND
ANSWERS ? YES
QUESTION # 1 :
LOYD'S ANSWER: 1867
CORRECT ANSWER: 1867
QUESTION # 2 :
LOYD'S ANSWER: 22 MILLION
CORRECT ANSWER: 22000000
QUESTION # 3 :
LOYD'S ANSWER: LESTER PEARSON
CORRECT ANSWER: PIERRE TRUDEAU
```

READY

Exam Program Listing

```
5 REM EXAM - EXAMINATION PORTION
10 CLEAR1000: CLS: N=25
20 DIM SA$(N), Q$(N)
30 S$ = "CANADIAN SOCIAL STUDIES"
35 REM LINE 30 IS SUBJECT OF EXAMINATION
40 D2$ = "JUNE 15, 1979"
45 REM LINE 40 IS DATE OF EXAMINATION
50 INPUT "STUDENT'S NAME "; D1$
100 Q$(1) = "IN WHAT YEAR WAS CANADA FOUNDED?"
```


Program Listing (cont'd)

```
110 Q$(2) = "WHAT IS CANADA'S POPULATION?"
120 Q$(3) = "WHO IS CANADA'S PRIME MINISTER?"
```

ETC ETC ETC

```
400 FOR K = 1 TO N
410 PRINT"QUESTION #"; K: PRINT Q$(K): INPUT"MY ANSWER: "; SA$(K)
420 NEXT
430 INPUT"DO YOU WANT TO REVIEW YOUR ANSWERS "; Z$
440 IF Z$ = "NO" THEN 600
500 FOR K = 1 TO N
510 PRINT"QUESTION #"; K: PRINT Q$(K): PRINT"MY ANSWER: "; SA$(K)
520 INPUT "DO YOU WANT TO CHANGE THIS ANSWER "; Z$
530 IF LEFT$(Z$,1) = "Y" INPUT "NEW ANSWER "; SA$(K)
540 NEXT
600 PRINT"PREPARE CASSETTE UNIT TO RECORD DATA.": PRINT: PRINT
610 INPUT"WHEN CASSETTE READY, PRESS 'ENTER' KEY "; Z$
620 PRINT#-1, N; D1$, D2$, S$
630 FOR K = 1 TO N
640 PRINT#-1, Q$(K), SA$(K)
650 NEXT
660 PRINT"THIS COMPLETES TODAY'S EXAMINATION. PLEASE RETURN"
670 PRINT"THE CASSETTE TO THE TEACHER. THANK YOU.": END
```

Marking Program Listing

```
5 REM EXAM - MARKING PORTION
10 CLEAR 1000: CLS
20 INPUT"WHEN CASSETTE READY TO INPUT DATA, PRESS 'ENTER' KEY "; Z$
30 INPUT#-1, N, D1$, D2$, S$
40 DIM SA$(N), Q$(N)
50 FOR K = 1 TO N
60 INPUT#-1, Q$(K), SA$(K)
70 NEXT
80 PRINT "FINISHED WITH CASSETTE"
90 CA$(1)="1867"
100 CA$(2)="22000000"
110 CA$(3)="PIERRE TRUDEAU"
```

ETC ETC ETC

```
400 FOR K = 1 TO N
402 IF K = 2 GOTO 600
404 IF K = 3 GOTO 700
410 IF SA$(K) = CA$(K) THEN S = S + 1
420 NEXT
430 PC = (S/N) * 100
440 PRINT D1$: "/S SCORE ON "; S$
450 PRINT "EXAMINATION ON "; D2$: " WAS"; PC: "%"
460 GOSUB 999
470 INPUT "DO YOU WANT TO REVIEW THE QUESTIONS AND ANSWERS "; Z$
480 IF Z$ = "NO" END
490 FOR K = 1 TO N
500 PRINT"QUESTION #"; K: ": ";
510 PRINT Q$(K): PRINT D1$: "/S ANSWER: "; SA$(K)
515 PRINT"CORRECT ANSWER: "; CA$(K)
520 GOSUB 999
530 NEXT
540 PRINT STRING$(60, "-"): END
600 IF VAL(SA$(2)) => 20000000 AND VAL(SA$(2)) <= 24000000 THEN S=S+1
610 IF VAL(SA$(2)) =>20 AND VAL(SA$(2)) <= 24 THEN S = S + 1
620 GOTO 420
700 IF SA$(3) = "PIERRE TRUDEAU" OR SA$(3) = "TRUDEAU" THEN S=S+1
710 GOTO 420
999 PRINT STRING$(60, "-"): RETURN
```


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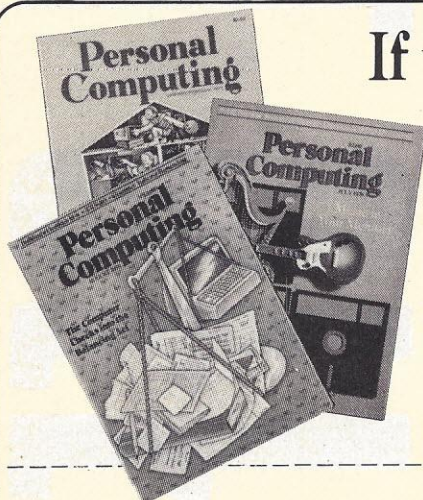
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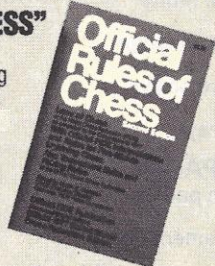
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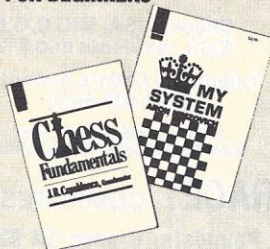
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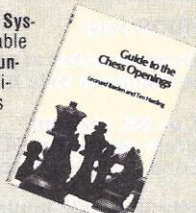
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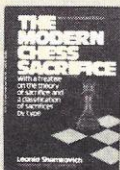


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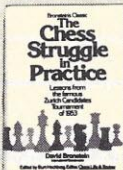
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CIRCLE 19

COMPUTER CHESS

HARRY SHERSHOW — Dept. Editor
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Chafitz' Big Move in Computer Chess

"Programmers specializing in the field of intelligent games are only now learning how to avoid mistakes and how to cope with the complexities of producing games of intelligence." That was the bold declaration made recently by Steve Chafitz, of Chafitz Company, MD., at the Consumer Electronic Show in Chicago. "Our own programmers have already made those mistakes and traveled down wrong paths many times. Now they are well out of the woods and speeding down the road designing some of the world's most advanced and challenging games of strategy!"

The company's programmers had learned the art of squeezing every bit out of a byte, Chafitz added with his unbounded enthusiasm, and were now packing programs tighter than many experts ever believed possible. The result, he said, is producing the best intelligence-based games on the market.

He noted that most past developments in the field of consumer products (and specifically computer-related games including TV games) had been hardware related. Manufacturers had always relied on advancements in integrated circuit technology to improve efficiency of microprocessors which, in turn, improved efficiency of the final product. As a result, noted Chafitz, there had been a lag between new hardware advances and improved final products. "Software for these processors," he declared, "can now be developed quickly by our talented programmers. I feel confident in stating that our new software advancements are going to outpace the Industry's hardware advancements. It's this zero lead time in software programming that will keep the Chafitz company out in front of its competition!"

Chafitz also announced that his company had succeeded in gathering together the world's foremost pro-

gramming talent now in the electronic-game field. "There isn't a company in the world that has the resources that we now have on our programming staff," he declared. "Anyone can design a hand-held football or baseball game which is known in the industry as a 'dumb' game and which is basically a skill game of manual dexterity. However, 'intelligent' games like chess and backgammon require considerable programming skills. People will continue to play football games for solitary diversion. But once they have an opportunity to challenge an intelligent game they immediately acquire the competitive feeling of playing against another human."

Earlier models of Boris have performed unmatched chess-playing feats against programs twice the size of BORIS. Chafitz emphasized that it is this earlier programming quality along with the company's several years of marketing experience in the consumer electronics industry, plus its new crack-jack programming staff that will mark the Chafitz company as the leader in the growing game market.

Newly added to the Chafitz' programming staff are Dan and Kathe Spracklen, a well-known husband and wife programming team from California. This couple authored the famous SARGON chess program which was designed to run on a \$1,500 microcomputer. SARGON astonished the computer chess community when it defeated AWIT, on a \$5,000,000 computer at the North American Computer Tournaments held last December in Washington D.C. The Spracklens have significantly improved their winning program and now have their most advanced version running on the new BORIS. That was Steve Chafitz's major announcement. The computer-chess community is anxiously waiting to see how this compact-sized superior-playing \$375 computer will fare against the big machines in upcoming competition.

At the same consumer show, Chafitz also unveiled a superlative computer



Paul Magriel, current World Backgammon Champion, demonstrates Chafitz' new ARISTOTLE, said to be the strongest-playing computer backgammon device in the world. Heading the staff of people who wrote the backgammon program using a new concept was Dr. Hans Berliner, of Carnegie-Mellon. ARISTOTLE was scheduled to play the winner of July's Merit World Backgammon Championships in Monte Carlo.

backgammon game that is being added to the BORIS product line. World Backgammon Champion, Paul Magriel, was on hand at the Chafitz press conference to demonstrate the new backgammon game, ARISTOTLE. After the demonstration, Magriel noted that ARISTOTLE was the most advanced and intelligent computer game available anywhere at any price. Development of ARISTOTLE was said to be the result of a team effort by the most prominent talents in the field of A.I. Dr. Hans Berliner along with Kim Brand of Intelligence Systems, Ltd. pooled their talents with Paul Magriel as consultant to create what is now being called a "revolutionary product". Dr. Hans Berliner is a computer scientist from Carnegie-Mellon University. He earned his Ph.D. in Computer Science and is regarded as a world expert in A.I. relating to games of strategy.

The computer programming method which was developed by Dr. Berliner and which is lodged in a "knowledge-base" makes computer "thought" approach the function of the human brain. This feat is described as a significant breakthrough in Computer Science and specifically in A.I. And ARISTOTLE is the first consumer product to utilize this new programming technique. Chafitz says it has plans to use this "knowledge-base" programming

method in a variety of consumer products.

ARISTOTLE is so powerful that it was the only non-human invited to play at the Merit World Backgammon Championships in Monte Carlo this past July. Arrangements had been made for the emerging winner of the Championships to pit his strategy against ARISTOTLE. (If the match did take place, the outcome and action will be described in a future issue of PC.)

In addition to ARISTOTLE, Chafitz also displayed its new Modular Game System (MGS). MGS utilizes computer modules no larger than a cigarette pack to house programs. The new Chafitz System cannot become obsolete because its modules are all interchangeable. The System is capable of playing chess, backgammon, checkers or any other game of strategy. Upcoming modules will soon be available to instruct and tutor beginner players through various levels of learning in various complex games. Unlike TV-cartridge-games which require the use of television, the Chafitz Modular Game System is only 9" x 9" x 2" and operates on batteries. It has been designed to serve as a handy travelling companion. A memory storage feature permits a game to be interrupted, then resumed up to one week later.

Also pulled out of Chafitz' bag of new tricks was another chess-playing computer which is the closest thing to the perfect "non-human chess partner". This game, called an "Electronic Response Game Board", is a full-size chess playing board that electronically senses the movement of playing pieces. The game is also designed to play checkers or any other game requiring a 64-square checkerboard. The player merely moves his piece on the board and the computer, sensing the move, responds by illuminating small lights on the squares indicating its own response to the human's move. The human player complies with the computer's decision and moves the piece as indicated.

Chafitz, Inc. is a privately held corporation with offices at 1055 First St., Rockville, MD., a suburb of Washington, D.C. President Steve Chafitz with his wife (and Corporate Vice President), Arleen, launched Chafitz, Inc. in 1971 with their meager \$75.00 savings. Today, Chafitz has become a major influence in the area of Consumer Electronic Games. In addition to the manufacture and world wide distribution of artificially intelligent electronic games, Chafitz, Inc. also operates a unique electronics specialty center which serves the metropolitan Washington, D.C. area.

A Chess Program for the Apple

By Charles Sullivan, Jr.

Having spent three months developing an assembly-language chess program for my Apple II microcomputer, I was naturally interested in testing it against the best in the field. So, during Easter vacation from teaching school in Northern California, I drove to San Diego to visit Dan and Kathe Spracklen, developers of SARGON, the reigning micro champion.

On Monday, April 9th, around 6:30 p.m., the games began. I was unprepared for what followed. From playing over games published in various periodicals, I expected SARGON II to play a competent class C game, but no better. But it turns out that the Spracklens are totally committed to improving

the level of chess for microcomputers. The SARGON program my CHASS-4 brainchild faced had been substantially improved since its 3rd-place finish at the December A.C.M. tournament in Washington, D.C.

For the first game we set both machines to look 3 plies deep. That is what both of us would have probably done at tournament games. SARGON II, running on the Z-80 based Jupiter III, forcefully won a pawn in the opening. But then, trying for another pawn, SARGON seriously weakened its king's position and CHASS 4 (the 4 because it's the fourth chess program I've written in the last year) evened the position. SARGON accepted the perpetual-check draw. Amazingly, both computers used only about 25 minutes each for the 25-

move game. Such speed is phenomenal, considering the quality of play produced (which I would estimate as low class B/high class C calibre.).

In the second game, SARGON II started out playing at 4 ply and won a pawn from CHASS, which was playing at 3 ply. But SARGON got into time trouble because Dan was experimenting with a version of SARGON which does not have an alpha-beta window. He had to adjust SARGON back to 3-ply so that it would not exceed the time limit of 40 moves in 2 hours. I adjusted CHASS 4 to 4 ply and the program equalized the position by the end of time control. But SARGON made a bold stab at counterplay, CHASS took the bait, and SARGON's better endgame technique, being used once again at 4

ply, forced CHASS to resign on move 53.

The Spracklens have incorporated into SARGON some of the features which made CHES 4.7, the current world's computer champion. In particular, SARGON uses a full-width, alpha-beta iterative (or staged) search. The Spracklens are also currently translating their program to run on the Apple II; Dan thinks that the 6502 has a faster effective clock speed for chess applications than the Z-80. With further improvements envisioned for SARGON II, I think that it will probably add one, and maybe two, more plies to its search. This added speed will certainly bring it into the class B category. There will be few programs, large or small, that will be able to beat SARGON II in a few months, I believe.

My program does not use a strict alpha-beta search. Once a good move has been found, the search tree is radically pruned. On the other hand, if a good move has *not* been found, it conducts a very extensive search until a

good one turns up. The benefit of this strategy is that when there is one move which is obviously a good one, such as the capture of the opponent's queen, it finds it and makes it rapidly. This saves time for thought about tougher, less clear-cut positions in later stages of the game. Cosmetically, my program has its own nice feature. Using the colorful low-resolution graphics of the Apple II, CHASS 4 displays the moves it is considering in its tree search. This creates a "window" into the computer's thinking for interested humans.

I feel that microcomputer hobbyists are making huge strides in the chess-playing field. However, recent experiments with my own program indicate that a search of at least 7 plies will be needed before micros come within hailing distance of class A players; and a much deeper search will be needed for more competent endgame play by micros. For the foreseeable future, however, SARGON II should be the best of the micros. Within a year it should be playing at a solid class B level, which is

where world-champion CHES 4.7 was just a couple years ago.

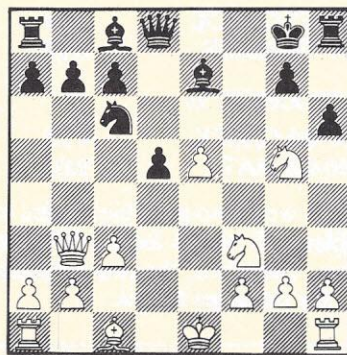
(Charles Sullivan, Jr. is a 30-year-old 6th-grade teacher who lives at 1026 Delaware Street, Fairfield, CA 94533. He has owned a computer for less than a year, has had only one class in computer science and has studied assembly language for the 6502 for only two weeks. This article proves that computer chess is not the exclusive province of artificial intelligence. If you own a micro and can write assembly language, you, too, can turn your small computer into a money-making chess-playing addict. There is even talk now of permitting computers to enter human chess tournaments. If that happens, you might even be able to put your machine to work for you. If Fischer can make a million playing Spassky, your TRS-80 ought to be good for a couple of hundred — enough for a down payment on a printer. And if you can write a decent chess program on your micro, as Charles Sullivan did, then you can count yourself a top programmer.)

Black-CHASS 4
(Ply 3)

White-SARGON II
(Level 3)

Comments by Charles Sullivan Jr.

1. e2e4 b8c6 2. b1c3 g8f6 3. f1c4 e7e5 4. c1f3 f6:e4! 5. c4:f7+! (THIS IS THE NORMAL, HUMAN TWIST IN SUCH SITUATIONS. IF 5.NXN, P-Q4 IS EVEN) 5...e8:f& 6. c3:e4 d7d5? (BLACK NEEDS TO PLAY 6...B-K2 SO THAT AFTER 7.P-Q3, R-B1, BLACK CAN GET HIS KING INTO SAFETY AND FREE HIS ROOK) 7. e4g5+, f7g8 8. d2d4?! f8b4+? (THIS LOSES A PAWN) 9. c2c3 b4d6 10. d1b3! d6e7 (OTHERWISE, 11. QXP+ RIPS BLACK UP) 11. d4e5 h7h6! (ACTUALLY THIS NECESSARY MOVE IS PROBABLY A BUG IN THE PROGRAM. A NORMAL THREE-PLY SEARCH WOULD SHOW THAT 11...NXP 12. NXN, BXN "WINS" A PAWN. THEN 13. BXN, QXB. 14. QXP+, K-B1 15. Q-B7 MATE! ACTUALLY, IT WOULD TAKE AT LEAST A 6-PLY SEARCH FOR A PROGRAM TO SEE THAT 11...NXP



Position after Black's 11th move

Black — CHASS 4
White — SARGON II
(Both at Level 3)

DOESN'T WIN A PAWN, AND IT WOULD TAKE A 9-PLY SEARCH FOR THE PROGRAM TO REALIZE THAT 11...NXP LEADS TO AN OUTRIGHT FORCED LOSS. THIS SIMPLE EXAMPLE DEMONSTRATES THE VAST INCREASE IN COMPUTING POWER THAT WILL BE NEEDED FOR MICROCOMPUTERS TO ACHIEVE CLASS A PLAYING LEVEL) 12. g5h3 c8:h3 13. g2:h3 d8d7 14. b3:b7? (WHITE'S POSITION IS PRECARIOUS AFTER THIS MOVE. BETTER SEEMS 14. B-K3 INTENDING 0-0-0 WITH WINNING PRESSURE) a8b8 15. b7a6 b8f8! 16. e1e2 (THERE DOESN'T SEEM TO BE A BETTER MOVE) d7:h3 17.a6d3 (NOT 17. QXN??, QXN+ WINS) h3e6 (BLACK MUST PROTECT THE IMPORTANT QUEEN'S PAWN) 18.d3e3 f8e8 19. f3d4 c6:d4+ 20. c3:d4 e6g4+ 21. e2f1 (HERE SARGON COULD KEEP SOME WINNING CHANCES WITH 21. K-K1, BECAUSE 21... Q-N7 22. R-B1 QRXP DOESN'T WIN A PAWN FOR BLACK SINCE 23. Q-KB3!, P-B3 24. R-R1 TRAPS BLACK'S QUEEN) g4d1+ 22. f1g2 d1g4+ 23. g2f1 g4d1+ 24. f1g2 d1g4+ 25. g2f1 (DRAWN BY REPETITION)

Practical Rating Program

...In 1972, F. Donald Bloss (currently Alumni Distinguished Professor in Geological Science at Virginia Polytechnic Institute and State University at Blacksburg, VA.,) wrote a book called "Rate Your Own Chess." In the book he tested 42 problems against 43 rated players and derived performance tables for each of the problems. The book (out of print, now) was published by Van Nostrand Reinhold Company of New York. Copyright on the book, once held by Litton Education Publishing, Inc., has been retained by Professor Bloss who is considering the possibility of having this excellent book re-issued in paperback form. The book and

Bloss' rating system seem to offer the best statistical method for rating computer-chess programs that has yet been suggested.

Gary L. Ratliff, 101 East Street, Mendenhall, MS 39114, explains how he has used the Bloss system in his own experiment (reference to the Bloss research has been used with permission from Professor Bloss): "Peter Jennings's Microchess program has already achieved a 'playing ability' based on its performance in tournaments against other chess playing programs," writes Gary. "However, the method developed and explained in F. Donald Bloss' *RATE YOUR OWN CHESS* makes it

possible now, to obtain a statistical accuracy of the playing strength of the Microchess program, as well as those of other computer programs.

"The program used is the version currently being sold by Personal Software as developed for the model 2001 PET with 8k memory. This version contains editing features, which allows the setting-up of a given position on the chess board. Also, Microchess 2.0 contains a built in chess-clock, which functions like a stop-watch to time the responses of the program. When testing your own program you may have to use a separate stop watch.

"The key to obtaining accurate playing strengths of chess programs consists in determining the 'average rating', based on correct solution times for 14 of Bloss' MATE-RATER problems. These problems were tested by Donald Bloss in his original research on a number of USCF **rated** players of various playing abilities. A correlation between time consumed to solve the problems and players' ratings produced the tables used to determine your (or your computer's) expected rating.

"Using Bloss' method for the experiment I set up each of the 14 listed problems and commanded MICROCHESS 2.0 to play. The performance of Microchess 2.0 with the problems are shown below together with its clock time, if it found a correct solution.

"Results of the experiment revealed that Microchess 2.0 was able to solve correctly seven of the eight **two-move** mates. The only one that was missed involved a mate by a Queen sac followed by a pawn promotion. Performance on the **three-movers** however, was not good. Only two of the six three-movers were correctly solved.

"The method used by Dr. Bloss in developing his time tables used a default of ten minutes if the derived solution was incorrect. Following this same procedure the approximate level of Microchess 2.0 is shown in the 'Rating Table'. Included in the table are clock times in seconds, established ratings for the problems and low and high scores achieved by the program in

MATE RATER 20		MATE RATER 25	
1. D5-A8 CHECK	2:51	1. E1-E5	2:10
2. A8-B7 MATE	4:19	Not correct	
MATE RATER 30		MATE RATER 35	
1. C3-E4 CHECK	5:12	1. B7-C7 CHECK	3:37
2. E5-C4 MATE	6:35	2. D5-E7 MATE	4:10
MATE RATER 40		MATE RATER 45	
1. A4-E4 CHECK	2:29	1. H4-E7 CHECK	2:48
2. D3-E4 MATE	2:32	2. D7-D4 MATE	4:18
MATE RATER 50*		MATE RATER 55	
1. G2-H4 CHECK	1:46	1. B7-B6 CHECK	4:23
2. F1-E1 MATE	3:54	2. H6-C6 MATE	9:01
by H4-F3			
2. F1-G1 MATE	3:58	*There were two possible replies to problem 50 which led to different mates. Therefore, the two solutions plus the times are shown.	
by E4-G4			
MATE RATER 62		MATE RATER 65	
1. F6-E6 CHECK	2:21	1. E3-H3 CHECK	2:06
2. E5-E6 CHECK	4:57	Not correct	
3. F6-G7 MATE	6:57		
MATE RATER 70		MATE RATER 75	
1. F6-G7 CHECK	5:09	1. D7-F6 CHECK	1:24
Not correct		2. C6-E8 CHECK	3:47
		3. F6-D7 MATE	4:06
MATE RATER 80		MATE RATER 85	
1. E4-F6	4:26	1. H2-G3	4:22
Not correct		Not correct	

Rating Table				
PROBLEM #	RATING	TIME (sec)	LOW	HIGH
20	1404	259	1276	1544
25	1300	600*	1219	1386
30	1395	395	1284	1516
35	1463	250	1340	1597
40	1533	152	1414	1663
45	1487	258	1363	1622
50	1504	236	1375	1647
55	1421	541	1304	1550
62	1286	417	1184	1394
65	1334	600*	1217	1463
70	1324	600*	1218	1440
75	1504	246	1402	1613
80	1457	600*	1330	1596
85	1491	600*	1373	1619
AVERAGE	1421	411	1307	1546
STD. DEV.	83	173	76	93

numerous passes through the same problem.

"Tut-tut, with an average rating of 1421, it's to be expected that I should win about 85% of my games against Microchess 2.0. As yet I have not lost any. But, this problem-testing warns me I'd better not get in position for a two-mover or I'd be done in. This test was done with Microchess set at level 8. It is possible to adjust the level of play, and the replies would be different for each level of play. Also these positions may easily be used with any chess playing computer which allows for editing of the start position.

"The problems selected from Bloss' book for Microchess testing were as follows, using the Forsyth notation and beginning with the 8th rank (capital letters are White, small letters are Black): White to move in all cases except problem #50:

Problem #20 2kr4/3r4/3n2pl/1PqQ3p/p2P1Bb1/2P3P1/6B1/6K1// (White mates in two)

Problem #25 r3kr2/1pP2p2/4bBq1/8/5Q2/8/6P1/4R1K1// (White mates in two)

Problem #30 3q3r/2pb1Qp1/1rpk1b2/3pn3/3Pp3/2N4P/PPP5/R3K2R// (White mates in two).

Problem #35 2kr4/1R1p4/3b4/1Q1N4/8/8/r2q2PP/6K1// (White mates in two)

Problem #40 1r6/1q3b2/7R/4pk1p/Q7/3P1P2/1P1B4/1K6// (White mates in two).

Problem #45 6rl/3R4/7B/npb2p2/p3k1bQ/1r3N2/1P4PP/5K2// (White mates in two)

Problem #50 r3kb1r/ppp2ppp/2n1p3/8/4q3/2NP1N1b/PPP1BPnP/R2Q1K1R// (Black to move and mate)

Problem #55 2kr2rl/pRp1p2p/B1n4Q/4p1n1/6q1/b1P2P2/P1PP2PP/5RK1// (White mates in two)

Problem #62 r3r2k/pp3p1p/5R1B/1bp1Q3/1q6/1P5P/P4PP1/6K1// (White mates in three.)

Problem #65 4R3/1rq2ppk/6p1/1r6/8/4Q3/1BP4P/1k6// (White mates in three).

Problem #70 2r1rk2/5p1p/3b1B2/3q4/1n3p2/3B1P2/1P2Q3/1K4R1// (White mates in three).

Problem #75 4k2r/3Nn1pp/b1QnB3/3p4/2q5/8/5PPP/5RK1// (White mates in three).

Problem #80 rn4nr/pppq2bk/7p/5b1P/4NBQ1/P2B4/1PP3P1/R3K2R/ (White mates in three.)

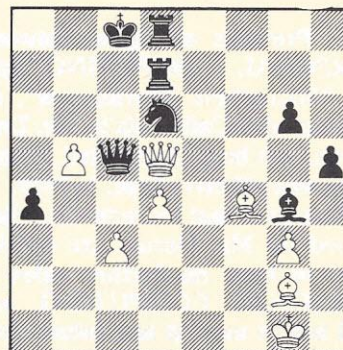
Problem #85 R6R/1r3pp1/4p1kp/4P3/1r2qpp1/8/3Q3K/8// (White mates in three).

"In Bloss' system, he has worked out tables for each of the problems. These tables are evolved starting with five seconds and increasing (in increments of 10 seconds) to 600 seconds

with ratings scaled to the time elements. If, then, a program required 260 seconds to find the solution (as Microchess 2.0 did for problem 20) then Bloss' table listed the approximate rating for 260 seconds at 1404 (with a HIGH of 1276 and a LOW of 1544). That value then appears in the Microchess table for problem 20. The other 13 problems are then installed into the computers chess program and the approximate ratings are again noted from Bloss' tables to derive the entire program profile.

"The basic method for conducting the experiment is to load Microchess 2.0 into the PET. The edit function was used to set up problem 20 (the first of the 14 Mate-Rater problems). The X command changed the computer from playing the Black pieces to playing the White pieces. The P command forces Microchess 2.0 to start to play and resets the chess clock to zero. The time shown on the clock and the move made by the computer were recorded and the response of Black was entered into the computer. Then the second move of the program and the time shown on the chess clock was recorded. This time was converted into seconds and the result rounded to the nearest ten second interval as is done in the table. The three results: rating, low, and high were entered into the results table. Each of the remaining 13 problems was then entered into the computer and the results recorded. In the event that the program failed to solve the position correctly the time was changed to 10 minutes or 600 sec. (This is the same method used for the human players who were tested by Bloss and is explicitly

Mate-Tester Problem #20
White to move and mate in two



Microchess solved problem in 4:19

mentioned in his section on the Statistical Basis for the Mate-Rater Tables).

"The table shows therefore, a rating, plus a high and a low figure for each of the 14 problems. The reason these change is because the response of the computer for each problem is different. If a reader times himself on his program on all fourteen of the mate-raters the average of his fourteen approximate ratings will usually be within 100 or 200 points of his true USCF rating. The

standard deviation shown in the table is given because when the TI-58 is set to compute the mean or average all the other statistical functions may be obtained by just pressing a few extra keys. Therefore, I give the standard deviation so that a reader wouldn't have to compute it as it's already given."

(Opinions from readers on rating chess programs through the Bloss method will be appreciated).

Valenti Program

Because of space limitations, the lengthy Valenti chess program, which has been appearing here in monthly installments, has been discontinued. Readers who are interested in the remainder of the program are invited to write to this department.

A Russian View of Chess Computers

This article is a reprint from the Aug. 1978 Russian magazine "Sputnik". That monthly magazine is published by the Novosti Press Agency, 2, Pushkin Square, 103006 Moscow, USSR. It is similar to the American Reader's Digest and reprints, in six languages, including English, a broad spectrum of articles appearing in many Russian publications.

Back in 1949 the American mathematician Claude Shannon suggested initiating work to devise an "artificial chess-player." Success in this field would automatically make it possible to compose programmes for employment of computers in wide-ranging fields of mental activity, above all, in solving control problems. It was thought that the electronic brain would achieve better results by exploiting its own potential, unlike that of the human brain and inaccessible to the latter.

The point is that man's life, his interaction with nature, and even elementary human relations, abound in situations in which man does not know how

to act because he does not have sufficient information about, for instance, how the partner with whom he is attempting to clear up relations will behave. In making a decision, a person believes that it is for the best, although this is far from always so: in order to find the only correct solution man would have to sort out a huge number of different but partly analogous cases. But an analysis like this would take not only a lifetime, but the lives of many generations. In chess, experts have calculated that the total number of possible combinations on the board reaches 10^{20} .

Is this a lot or a little? Considering that the number of the first ten moves in a chess game alone equals 1,695,188,220,100,544 by 10^{12} , it can be imagined how great are the number of possible moves in a whole game. In order to reproduce them on the board, the world population would continuously have to move chessmen for 217 billion years! As a curiosity, ever since man developed the gift of speech,

all people of the world have said only 10^{16} words. This explains why there is simply no other way out except by artificially reducing the number of possibilities. From this point of view, a chess match is worthwhile.

Besides, in making its choice, the machine exhibits no human emotions. On the other hand, perhaps the majority of human solutions are accompanied by emotions. Probably, this was why scientists said that if a chess programme that would be able to play on the level of a master is created, it will be able to programme anything in any field. Perhaps this provides the answer to the question why a computer should play chess.

Scientists of the countries in which chess programming research is being conducted have decided to hold world computer championships once in three years.

The following comment was made by Mikhail Botvinnik, D.Sc. (Engineering) and former world chess champion.

"The tournaments are timed to coincide with congresses of the IFIP (International Federation of Information Processing) and serve as a medium of exchange of findings in this important field of research. Machine play is a curious sight. Programme composers sit at chessboards. Along special communication channels they report to their computers, which are far away, the 'opponent's' move. The machine's reply move is reproduced on TV (display) and re-enacted on the board. While waiting, the scientists talk, analyse the position, argue, joke and on frequent occasions criticize the game of their

Announcement . . .

. . . Previous affiliation between **PERSONAL COMPUTING** and the "Microchess Tournament", as conducted in California by Mr. Don Gerue, has been terminated by this magazine effective Sept. 1, 1979.

Results of that tournament, when issued by Mr. Gerue, are considered to have no further value to **PERSONAL COMPUTING** and will not be used in any future issue of this magazine.

News of microcomputer chess and computer-chess programs originating from other sources, and having no connection with Mr. Gerue's "Microchess Tournament" are welcomed by PC and will continue to be used.

The field of microcomputer-chess continues to grow rapidly and **PERSONAL COMPUTING** is ready to cooperate in promoting such growth.

programmes. This is natural: the computer tournament is a sports competition only in form. Actually, it has scientific aims."

The first world championship was held in Stockholm in 1974. It was a match between the Soviet programme *Kaissa* and the American programme *Chess 4*. It was won by *Kaissa*. In August 1977 it again made the finals held in Toronto, this time playing against the improved model *Chess 4.6*, which became the second world champion.

An elimination tournament in 1980 will be played by a new Soviet programme, named *Pioneer*. It has been worked out by experts of the All-Union Research Institute of Electrical Engineering and two Moscow computing centres under Botvinnik's supervision.

The creators of this programme took

a basically different approach to the problem of an "artificial chessplayer". While previously experts relied on the machines's own capabilities, the *Pioneer* programme is based on modelling a chess master's thinking.

All signs indicate that the *Pioneer* is to date the only programme of its kind which employs a chess master's methods. This conclusion can be drawn if one considers that in the summer of 1977 *Pioneer* successfully solved a complicated problem set by the Soviet Georgian chessplayer G. Nadareishvili. (This problem was fully described in PC's Jan. issue.) At the same time, the American programme *Chess 4.6* discovered the first two moves of the problem, subsequently sorted out about a million possible moves, but failed to find the correct one. . .

For the sake of objectivity it must be

noted that so far *Pioneer* plays slowly. The computer which ensures its work, unlike the American machine *Cyber-176*, which serves *Chess 4.6*, is not fast. For instance, the solution of the Nadareishvili problem on a machine of the *Cyber-176* class, would have taken *Pioneer* less than 10 minutes. Not every human player, even top class, is able to play that fast.

The slowness of the Soviet computer is thus compensated for by the "intellectual" power of *Pioneer*. On the other hand, the fastness of *Cyber-176* can ensure the *Chess 4.6* programme a gain in time. Now we can only wait and see what results the world championship in Australia will bring.

At any rate, one thing is already clear: unlike the previous ones, the future world champion will be a good chess master.

Chess Discussion

. . . The NCC '79 panel on computer chess, chaired by Dennis Cooper (of the COKO program) included Kathe Spracklen, Monty Newborn, Tom Truscott, Tony Scherzer, Ken Thompson and Mike Alexander. The discussion was held at the New York Hilton during the June conference. Participants involved in this review of computer chess all agreed that a grandmaster program in chess will eventually emerge from the computer. They could not agree on when this occurrence might happen and predictions ranged from two years to about 10 years. Mike Alexander said that it was not surprising for him to learn that all programmers, as a rule, play better chess than their own programs. Kathe Spracklen, on the other hand, said that she has been unable to beat her new SARGON program. "Someday," she said. "Someone who is not a grandmaster is going to write a grandmaster chess program. And microcomputers may well lead the way and will certainly help in developing grandmaster chess. Furthermore, microcomputers and microcomputer-chess are improving at an incredible rate and soon they will be threatening the big machines." The panel discussion ended on a bold declaration from David Levy in the audience. He stood

up and said he would pay \$1000 to any computer that could beat him. However, because of some static in the microphone transmission, it wasn't clear whether this remark of Levy's is a firm commitment by him to cough up a grand to any computer that manages to beat him. In any event this public challenge has left the computers huddled in a corner and trembling at Levy's belligerence. Also left muddled in the transmission was how much the computer

would have to pay if it lost to Levy. Mentioned during the panel discussion was the fact that Walter Browne, third-rated international grandmaster and second highest-rated player in the US, was working with Intel in writing a computer chess program. If this is true, then the question brought up earlier by the panel might well be answered shortly: Can a grandmaster write a grandmaster computer-chess program?

A Book Review

("America's Chess Heritage" by Walter Korn, David McKay Company, Inc., New York, NY 302 pp, hb, \$12.95)

. . . Many books have been written about chess and chess players but this is the first I have seen that combines the acute focus of contributions of American chess players with an informed, fascinating account of their individual personalities, strong points and achievements.

Most of all, the range of games chosen by the chronicler gives an overview of chess in this country which can be matched only by culling through many

other publications. Because Walter Korn is the editor of the well known "Modern Chess Openings 11," he is highly qualified for this task.

This is more than merely a mechanical compilation of chess games; the biographical and literary information alone is well worth the reading.

Chapter 14, "New Frontiers," contains a perceptive, interesting account of computerization in chess, including - *mirabile dictu* - a reference on page 279 to Personal Computing's chess column.

All in all, a witty, well written and charming account of America's contribution to chess. —MORRIS MILLER

Knight on Tour

... Hot and tired by this time, the Knight has been jumping about on the chessboard for many centuries, now, posing a challenge to mathematicians, as well as chess players, on how to make its tour without touching the same square twice. Professor Chester W. Dyche, Department of Mathematics, California State College of Stanislaus, submits a short neat BASIC program that produces a successful tour for the Knight starting from any position. "This is not a new problem," says Prof. Dyche, "and has been around since the early 1800's. About that time, WARNSDORF proposed the following algorithm:

"1. Assume a current position on the board.

2. Find each valid primary position from the current position; that is, those moves which remain on the board or which have not already been occupied by the Knight on its tour.

3. From each valid primary position find all valid secondary moves in the same manner.

4. For your next current position choose the primary position which has the smallest non-zero number of secondary moves possible.

5. Return to step 2 until the tour is complete."

Although this algorithm was originally prepared for a pad-and-pencil solution, Prof. Dyche has used it to write a computer program. "This BASIC program," says Dyche, "is prepared from the above algorithm. I have run it on a PDP 11/45 and on a TRS-80 with Level II BASIC. It takes several minutes to complete the path on the TRS-80 so you may want to insert a print statement to follow the moves as they are made."

The 10th ACM Chess Tourney in Detroit will be held in October. Final date for submitting applications by chess-program participants is September 15th. Write to Prof. Monty Newborn, School of Computer Science, McGill University, Montreal, Quebec, H3A 2K6 Canada.

```

100 REM * * * * *
110 REM * KNIGHT'S TOUR PROGRAM *
120 REM * BY CHET DYCHE *
130 REM * CALIF. STATE COLLEGE *
140 REM * STANISLAUS *
150 REM * * * * *
160 DATA -2,-1,-2,1,-1,2,1,2,2,1,2,-1,1,-2,-1,-2
170 DIM C(8,8),R0(8),C0(8),J2(8),K2(8),K9(8)
180 FOR I = 1 TO 8
190 READ R0(I),C0(I)
200 NEXT I
210 A=1
220 PRINT"GIVE THE STARTING POSITION FOR THE KNIGHT'S TOUR,"
230 PRINT"E.G. 2,3 MEANS ROW 2, COLUMN 3 NUMBERING FROM"
240 PRINT"THE UPPER LEFT CORNER OF THE CHESS BOARD."
250 PRINT:PRINT "STARTING POSITION";
260 INPUT R1,C1
270 IF R1<1 OR R1>8 OR C1<1 OR C1>8 THEN PRINT "ILLEGAL
    STARTING POSITION":GO TO 220
280 J=R1:K=C1
290 C(J,K)=A
300 REM * * * * *
310 REM * BEGIN SEARCH FOR VALID MOVES *
320 REM * FROM THE CURRENT POSITION *
330 REM * * * * *
340 FOR I = 1 TO 8
350 J1=J+R0(I):K1=K+C0(I)
360 IF J1<=0 OR J1>8 OR K1<=0 OR K1>8 THEN 460
370 IF C(J1,K1)<>0 THEN 460
380 J2(I)=J1:K2(I)=K1:M2=0
390 FOR L = 1 TO 8
400 J3=J1+R0(L):K3=K1+C0(L)
410 IF J3<1 OR J3>8 OR K3<1 OR K3>8 THEN 430
420 IFC(J3,K3)=0 THEN M2=M2+1
430 NEXT L
440 IF A<M2 THEN J=J1:K=K1:GO TO 660
450 K9(I)=M2:GO TO 470
460 K9(I)=0
470 NEXT I
480 REM * * * * *
490 REM * PICK THE PRIMARY POSITION WHICH HAS *
500 REM * THE SMALLEST NUMBER OF SECONDARY MOVES *
510 REM * * * * *
520 M9=9
530 FOR I = 1 TO 8
540 IF K9(I)=0 THEN K9(I)=9
550 IF M9<=K9(I) THEN 570
560 M9=K9(I):I9=I
570 NEXT I
580 REM * * * * *
590 REM * RECORD SUCCESSFUL MOVE AND RETURN TO *
600 REM * SEARCH FOR NEXT MOVE UNTIL BOARD IS *
610 REM * FULL. FAILURE OR FULL BOARD, PRINT *
620 REM * * * * *
630 IF M9<>9 OR A=63 THEN 650
640 PRINT" UN":GO TO 680
650 J=J2(I9):K=K2(I9)
660 A=A+1:C(J,K)=A
670 IF A<64 THEN 340
680 PRINT"SUCCESSFUL TOUR FROM ",R1,"",C1
690 FOR I=1 TO 8
700 FOR L = 1 TO 8
710 PRINT TAB((L-1)*4);C(I,L);
720 NEXT L
730 PRINT
740 NEXT I
750 END

```

Ready

RUN

KNIGHT 10:04

24-Apr-79

GIVE THE STARTING POSITION FOR THE KNIGHT'S TOUR,
E.G. 2,3 MEANS ROW 2, COLUMN 3 NUMBERING FROM
THE UPPER LEFT CORNER OF THE CHESS BOARD.

STARTING POSITION? 8,2

SUCCESSFUL TOUR FROM 8,2

45	26	5	22	47	38	7	20
4	23	46	39	6	21	50	37
27	44	25	48	51	60	19	8
24	3	40	61	32	49	36	55
41	28	43	52	59	54	9	18
2	13	64	31	62	33	56	35
29	42	15	12	53	58	17	10
14	1	30	63	16	11	34	57

COMPUTER GAMES OF OTHER SORTS

("Intelligent" Computer games welcomed by this department. Address all correspondence to COMPUTER GAMES DEPARTMENT, Personal Computing.)

On the Road to ADVENTURE

A recent news item in *COMPUTER-NEWS* (Issue #169), a regularly appearing publication of the University of Toronto, Ontario, declared that an intolerable traffic jam was taking place at the console of the PDP-10 computer there due to the popularity of the game of *ADVENTURE*. The news item, written by Dr. Edmund West, stated: "Many computer customers are objecting to the fact the computer games are available on the DEC-10. Because the game of *ADVENTURE* is both large and popular, the increased swapping which results when several users play games at the same time can cause system response to be significantly degraded."

More information on this University problem has been received from Dr. West who has also forwarded a list of the 52 games currently available on the computer. The menu includes *ADVENTURE*, Checkers, *DUNGEON*, Chess, Wumpus, Cookie, Ungarb, Gold, HBomb and other exotic dishes. "We find," writes Dr. West, "that allowing novice computer users to play these games is an effective way of familiarizing them with inter-active computing. Typically, after a brief flurry of playing various games, our users settle down and learn to use the computer properly in their own work. The availability of games on our DEC-system-10 is somewhat controversial. Our policy is to make the games available to those who wish to play them. However, we must make sure that no customer is inconvenienced."

David Lebling of MIT's Laboratory for Computer Science has followed the genesis of the game from its infancy (which hasn't been too long ago). "Back in 1976," says David, "Wil Crowther was working at Bolt, Beranek and Newman Inc. in Cambridge. At that time, staff members were relaxing with a newly invented game called *Dungeons and Dragons*. This was a group game involving 10 people or so, who interacted with a Dungeon Master. He provided the res-

ponses to a player's actions. Crowther thought it might be interesting to have something like that on the computer so he started writing it. The people at Bolt, Beranek and Newman played it for awhile and thought it was interesting. Eventually, Don Woods at Stanford University took over the FORTRAN program and wrote additional parts to it. This was early in 1977. *ADVENTURE* started spreading mostly through the PDP-10 community. Lately, people have translated the sources into various other versions of FORTRAN and the game is currently available for different systems. To date, there have been a number of different versions of *ADVENTURE*. A current one is Version 2.0 written recently by Kent Blackett and Bob Supnik of DEC.

"There is no organized group competing for position placement in *ADVENTURE*. It is not a competitive game; therefore, no one plays against each other. The thing I like most about *ADVENTURE* is the problems that are involved. The players have to solve a sequence of preliminary problems to get at certain objects. For example, how to get past a sleeping dragon to scoop up a treasure. They are not mathematical problems, but are more in line with problem solving as in detective novels, for example.

"Most of the large data base consists of hundreds of messages that are printed out in the course of the game. Some of the messages are triggered by key actions which will provide a complete description of a room the player has entered, for example. Some messages are triggered by objects; other messages are printed out as the result of solving a problem. The games are essentially non-random — the problems don't change. Once you've played the game and have learned all the answers you can theoretically solve the problems every time. For example, if I know that by picking up a golden axe in one of the caves I will lose half my collected treasures, then next time I

play the game and come into that particular room, I simply wouldn't pick up the axe.

"It takes days or weeks to solve the entire thing. So you usually play the game for only short periods and you may wind up with a score of 48 points out of a possible 400. The game consists of solving problems to get certain treasures. By grabbing all the treasures you can and depositing them safely, and by visiting all the places you can get into, you pick up a certain number of points. Once you have acquired all possible points, then you enter an **end game**. Basically, the end game is a single problem, but it is very difficult. I think the current version of *ADVENTURE* is 430 points and the average problem is 20 or 30 points."

Modifications of the game are available now, on tape or disk, for most of the small computers including TRS-80, PET and Heath-8. Prices vary from \$10 to around \$30.

Russ Walter, author of *SECRET GUIDE TO COMPUTERS* describes *ADVENTURE* in the second volume of his six-books set:

"The game is exciting because as you wander through forests and caves, the computer tells you what you see. But you don't know whether what you're seeing is important. For example, when you stumble into a strange room, the computer might tell you that there is a small cage in the room. That's all it tells you. You must measure its significance yourself. Should you pick up the cage? Try to break it? Kiss it? Carry it? Try anything you like; give any command to your computer-body that you wish and see what happens."

The following partial readout is from the Heath H-8 *ADVENTURE* version as written by J.G. Letwin. It is available on disk and can be purchased for \$10 from Heath Users' Group, Hilltop Road, St. Joseph, MI 49085. In the following dialogue, the computer's voice is indicated by bold-faced letters while the human player hides in the underbrush of light-faced letters.

Treasures and Tunnels . . .

Welcome to ADVENTURE!! Would you like instructions?

yes

Somewhere nearby is a colossal cave, where others have found fortunes in treasure and gold, though it is rumored that some who enter are never seen again. Magic is said to work in the cave. I will be your eyes and hands. Direct me with commands of 1 or 2 words. I should warn you that I look at only the first four letters of each word, so you'll have to enter northeast as "NE" to distinguish it from "north". Should you get stuck, type "help" for some general hints. For information on how to end your adventure, etc., type "info".

help

I know of places, actions, and things. Most of my vocabulary describes places and is used to move you there. To move, try words like forest, building, downstream, enter, east, west, north, south, up or down. I know about a few special objects, like a

black rod hidden in the cave. These objects can be manipulated using some of the action words that I know. Usually you will need to give the object and action words (in either order), but sometimes I can infer the object from the verb alone. Some objects also imply verbs: in particular, "inventory" implies "take inventory", which causes me to give you a list of what you're carrying. The objects have side effects; for instance, the rod scares the bird. Usually people trying unsuccessfully to manipulate an object are attempting something beyond their (or my) capabilities and should try a completely different tack. To speed the game you can sometimes move long distances with a single word. For example, "building" usually gets you to the building from anywhere above ground except when lost in the forest. Also, note that cave passages turn a lot, and that leaving a room to the north does not guarantee entering the next from the south. Good luck!

You are standing at the end of a road before a small brick building. Around you is a forest. A small stream flows out of the building and down a gully.

in house

You are inside a building. A well house for a large spring. There are some keys on the ground here. There is a shiny brass lamp nearby. There is food here. There is a bottle of water here.

take keys

OK

take lamp

OK

take food

OK

take bottle

OK

go outside

You're at the end of the road again.

go s.

You are in a valley in the forest beside a stream tumbling along a rock bed.

go s.

At your feet all the water of the stream splashes into a two-inch slit in the rock. Downstream the stream bed is bare rock.

go s.

You are in a small chamber beneath a three by three steel grate to the surface. A low crawl over cobbles leads inward to the west. The grate is open.

go w.

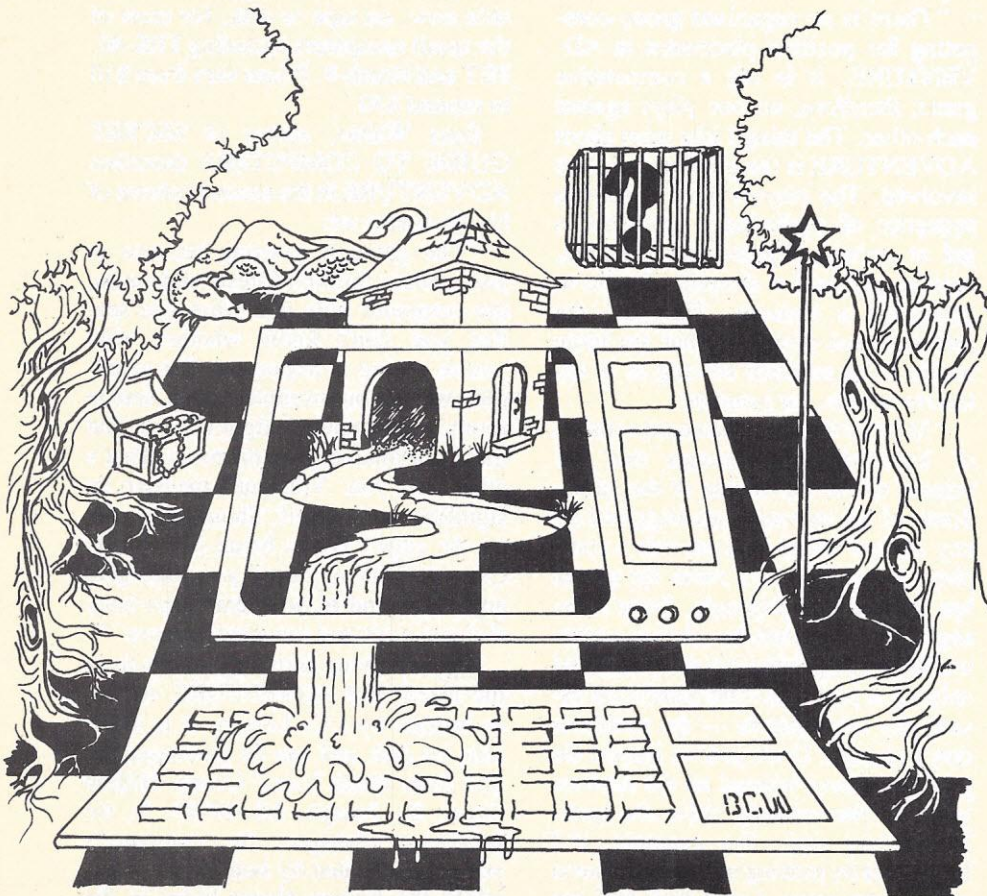
You are crawling over cobbles in a low passage. There is a dim light at the east end of the passage. There is a small wicker cage discarded nearby.

get cage

OK

go w.

You are in a debris room filled with stuff washed in from the surface. A low, wide passage with cobbles becomes plugged with mud and debris, but an awkward canyon leads upward and west. A three-foot black rod with a rusty star on an end lies nearby.



info

If you want to end your adventure early, say "quit". To see how well you're doing, say "score". To get full credit for a treasure, you must have left it safely in the building, though you get partial credit just for locating it. You lose points for getting killed, or for quitting, though the former costs you more. There are also points based on how much (if any) of the cave you've managed to explore; in particular, there is a large bonus just for getting in (to distinguish the beginners from the rest of the pack), and there are other ways to determine whether you've been through some of the more harrowing sections. If nothing interesting happens, you haven't found them all yet. If something interesting does happen, it means you're getting a bonus and have an opportunity to garner many more points in the master's section. I may occasionally offer hints if you seem to be having trouble. If I do, I'll warn you in advance how much it will affect your score to accept the hints. Finally, to save paper, you may specify "brief", which tells me never to repeat the full description of a place unless you ask me to (with "look"). You can save the state of the game by saying "save". You will be asked the name of a file to which the information is to be written. You may then later restart the adventure from that point by supplying that file name to the "which cave?" question.

take rod

OK

go w.

You are in a splendid chamber thirty feet high. The walls are frozen rivers of orange stone. An awkward canyon and a good passage exit from east and west sides of the chamber. A cheerful little bird is sitting here singing.

quit

Do you really want to quit now?

yes

OK

You scored 48 out of a possible 350, using 69 turns. Your score qualifies you as a novice-class adventurer. To achieve the next higher rating you need 53 more points.

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BY THOMAS A. THROOP

New Bridge-Playing Products

At the June Consumer Electronic Show in Chicago two dedicated electronic bridge playing products were displayed. One of them, "Bridge Challenger" manufactured by Fidelity Electronics Ltd., was discussed in the July issue of PC. This product allows the computer to act as one, two, three, or even all four players with humans bidding and playing the remaining hands. First, the cards are dealt in a normal routine. Then, for the hands the computer is to play, those cards are passed over a reader which decodes bar codes on the cards (in the same manner that grocery stores scan the bar codes on some of their products.) Cards for each of these hands are then placed face down on a green felt cloth in numbered boxes corresponding to the order of scanning. The computer identifies a card it is playing by referencing the corresponding location on the felt cloth.

Much effort was spent by Fidelity on the bidding portion of the program. A player may choose an American style or an Acol style, (the latter popular in Europe,) for any hands the computer is to bid. Also, the player may select one or more of the following special conventions for the computer hands: weak one no-trump opening, Jacoby transfers, strong artificial two club opening, Baron, and a 13-15 point two no-trump response to an opening suit bid of one (rather than the Acol 11-12 point version). The bidding program also knows some fancy things about cue-bidding aces when investigating slam possibilities.

Fidelity spent less effort in deriving its playing program. The obvious result is that "Bridge Challenger" is better as a bidder than as a player. I plan to report on a few deals played with this product as soon as they are available. "Bridge Challenger" should be reaching retail stores this fall, according to Fidelity.

TRYOM also announced a similar product at the same Electronic Show. Cards, dealt normally, are likewise scanned to decipher bar codes. As with Fidelity's product, the computer can act as one, two, three, or all four players.

One improvement is evident when comparing the two products. TRYOM is planning to produce its program in the form of a replaceable cartridge. This will provide a more versatile product; because, when more advanced program versions are developed, they may be substituted for the original cartridge.

Software development for TRYOM's product is a bit behind schedule. The product may or may not reach the retail stores in any appreciable quantities by Christmas.

I returned from Chicago via the Personal Computing Festival of the National Computer Conference in New York City, where I was invited to give a talk on "Computer Bridge".

Here is a deal of the Duisman program which I have mentioned earlier. The deal is number 52 of set 3.65 as dealt by the PET. Before reading further, those of you with PET computers should ask your PET to generate this particular deal and then see how you do at the contract of 4 spades.

For TRS-80 or APPLE owners, the complete deal is as follows:

NORTH
(Dummy)

♠ AQ9
♥ J7
♦ K10765
♣ 1042

COMPUTER WEST

♠ 54
♥ Q10
♦ A9843
♣ J875

COMPUTER EAST

♠ J86
♥ A8542
♦ QJ2
♣ K9

SOUTH
(You)

♠ K10732
♥ K963
♦
♣ AQ63

Against the 4-spade contract, the computer as West led off with the 10 of hearts. I played the jack from dummy, computer East went up with the ace, and I followed with the three. East re-

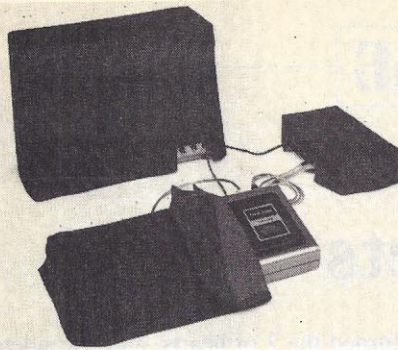
turned the 2 of hearts, and I wondered which heart to play. I certainly didn't want my king ruffed if the opening lead had been a singleton. I finally decided to play the 6, although a good case can be made for playing the 9. Somewhat to my surprise, West won with the queen, revealing that he had chosen an unusual lead.

At trick 3 West shifted to the 3 of diamonds, I played the 5 from dummy, and East played the jack, which I ruffed with the spade deuce. Then I led the heart 9! If West had made an unusual opening lead of the 10 of hearts from the doubleton Q-10, perhaps the computer program would not consider the 9 as a winner, since the king was not yet played. Of course, if West held one or more hearts, it would be easy for me to discard a losing club on the heart 9. West showed out, but then as hoped did not ruff with a small spade to prevent my discard. West discarded the diamond 4. I threw the losing 2 of clubs from dummy, and East followed with the 4 of hearts.

The question now was what would West play on my lead of the king of hearts? If he again refused to ruff, I could likely take the rest of the tricks. It would, of course, require a friendly distribution of the diamond suit with East holding the jack of spades. On the lead of the king of hearts from my hand West again failed to ruff, as hoped, and discarded the 8 of diamonds. Therefore, I discarded the potential losing 4 of clubs from dummy, and East then followed with the 5 of hearts.

I cashed the ace of clubs and cross-ruffed the rest of the hand as indicated on the next page, thus making 5 spades on the deal. The diamond distribution was friendly, and on the lead of the king of diamonds from the dummy at trick 12 East's spade jack was trapped, with my holding of the K-10 of spades over his J-8. This is known as a "trump coup". Actually, because a winner (the Queen of clubs) was ruffed at trick 11 to gain entry into dummy, this was a "grand trump coup"!

I would like to hear from those of you who have been playing against any of the versions of the Duisman program.



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CIRCLE 42

COMPUTER BRIDGE

	Computer West	North (Dummy)	Computer East	South (You)
Trick 1	10H	JH	AH	3H
2	QH	7H	2H	6H
3	3D	5D	JD	2S
4	4D?	2C	4H	9H!
5	8D?	4C	5H	KH
6	5C	10C	9C	AC
7	7C	9S	KC	3C
8	9D	6D	QD	3S
9	8C	QS	8H	6C
10	AD	7D	2D	7S
11	JC	AS	6S	QC
12	4S	KD	8S	10S
13	5S	10D	JS	KS

Space permitting, I will comment on the proper way to play any of the hands you may have found of particular interest.

I received an interesting letter from Bob Hamman of the "Dallas Aces." The "Aces" were organized in late 1967 and began full-time tournament activities in 1968. Since that time the "Aces" have compiled a remarkable record in competitive bridge, winning 3 world championships, 4 seconds, 2 thirds, 1 world pair championship, and 7 national team championships. Team members have changed substantially in the past years, but Bob has remained a member since 1969.

Regarding the use of a computer in preparing for bridge matches, Bob writes: "Our use was to generate pairs of hands which met certain specifications (that is, No Trump opener facing an opening bid) in areas where it would be useful to practice our bidding techniques. This enabled us to bid hundreds of hands which fell within certain parameters — and was certainly the equivalent of several years of tournament play. It is our opinion that this statistically oriented approach to technical bidding was very important in our successes. Even though we use many practice techniques to improve our performance, the simple process of generating hands by computer is undoubtedly one of the more important methods utilized."

Judging from the enviable record of the "Aces," I would have to agree with Bob. The use of a computer program to selectively generate bridge hands that meet specified criteria is a significant tool in developing and perfecting a successful bidding system.

Walter L. Jones, who presently teaches physics at the University of Canterbury, Christchurch, New Zealand, recently became interested in using personal computers for bridge training. He writes, "We expected our own first efforts to be used only by neophytes. Instead, they have been most popular with top players interested in new bidding techniques and in improved methods of hand evaluation. The New Zealand national bridge organization has an informal interest in computers for training their (so far uninspired) international teams."

Dr. Jones describes his efforts, and those of his associates, in developing and planning a dealing program for use in bidding practice. The user selects a particular "shape", such as 5-3-4-1 (5 spades, 3 hearts, 4 diamonds, and 1 club) for, say, the South hand. This holding is selected from a "library of shapes". Thirteen cards are then selected randomly by the computer for South's hand so that the specified shape is satisfied. The remaining thirty-nine cards are then distributed randomly to the other hands. Jones does not explain exactly how the program works from here. For instance, does the computer bid any of the hands or must all be bid by human players? I shall report further when I have additional information. Any reader wishing to contact Dr. Jones should address him at 17 Longhurst Ter., Christchurch 1, New Zealand.

Correspondence or exchange of ideas is invited by this column. Address all letters to Computer Bridge, PERSONAL COMPUTING, 1050 Commonwealth Ave., Boston, MA 02215.

WHAT'S COMING UP

SYSTEMS

Computers for Home and Personal Use

Ohio Scientific offers two new microcomputers. The C4P MF is targeted to personal computerists and educational, scientific and professional users. Model C8P-DF is intended primarily for home applications.

Features of the C4P MF include a 2048 character display (32 X 64) with 16 colors and an effective graphics resolution of 256 by 512 points. The standard computer runs at least twice as fast as earlier Ohio Scientific models. (Even faster operation is possible with the GT option.) C4P MF was designed as a large memory capacity mini-floppy based computer.

The standard machine comes with 24K static RAM and a single mini-floppy. It can be directly expanded to 48K and two mini-floppies.

For the professional user, the computer features a full 64 character display width, a line printer interface, modem interface, a full keyboard with lower case and advanced disk-based software including an Information Management System, Word Processor and a library of program development tools.

For the personal user, C4P MF offers instant program loading, color graphics, high speed animation, sound output, a D/A converter for music and voice output, joystick interfaces, and a library of games, educational programs and personal finance aids.

For the home computerist, the C4P MF has a real time clock, a home control operating system, an AC remote control interface and a home security and fire alarm interface.

The unit comes in a 14 pound typewriter size package. Price is \$1695.

Intended as a home computer system, the C8P-DF includes a full keyboard, BASIC, and elaborate video display capable of generating 2048 upper and lower case characters, up to 16 colors and high resolution graphics. Other features include sound output, a D/A converter for voice and music, joystick interfaces and a library of entertainment, education and personal finance software.

The C8P-DF utilizes two 8-inch floppies, giving it comparable storage to many small business computer systems. This capacity allows it to store on line the pertinent information for use as a home controller.

Through its AC control interface, the computer system can inject control signals on the AC power lines of a house, controlling remote switches and dimmers. Thus, the computer can turn appliances and lights on and off as well as dim and brighten lamps.

The computer system is also interfaced with a wireless home security system which includes smoke detectors, door contact switches, window switches, an automobile burglar

alarm and auxiliary devices. Through this home security system the computer will be notified immediately in the event of fire, break-in or tampering.

An optional voice I/O system including a Votrax output module can synthetically generate English speech. Another option, the Universal Telephone Interface system, lets the computer dial any telephone number via rotary dial or touch-tone telephone lines. It can automatically answer telephones and communicate via touch-tone signals or its voice output as well as conventional 300 baud modem signals.

These features are tied together in a home control software system which provides programming capabilities for all the I/O devices along with a Foreground-Background operation. Using the Foreground-Background operating system, the computer can monitor a wide range of home devices while functioning as a conventional personal computer.

Applications include turning appliances on and off at will, and monitoring home security. The system can automatically call the fire department or the police department in the case of intrusion or fire. The user can instruct the computer via touch-tone signals from anywhere in the world to perform tasks in the home. The user can also interrogate the computer to find out what has occurred in the home.

Prices for the C8P-DF start at \$2597.

For more information on these computers, contact Ohio Scientific, 1333 S. Chillicothe Rd., Aurora, OH 44202; (216) 562-3101. *Circle No. 91*

Micro-68 Price Cut

Electronic Product Associates cut prices on its basic microprocessor, the Micro-68a. This system comes completely assembled and ready to use. Built around the Motorola/AMI/Hitachi 6800 microprocessor, the EPA system features an integrated power supply, hexadecimal keyboard, six-digit LED display, 512 words of PROM (expandable) and 128 words of RAM (also expandable). Edge connectors allows for additions to the basic system. The reduced price is \$399 complete.

Contact Electronic Product Associates, 1157 Vega St., San Diego, CA 92110; (714) 276-8911. *Circle No. 92*

Accounts Receivable and Customer Billing System

Better Programming Systems (BPS) announced a new Accounts Receivable and Customer Billing system to complement the available Payroll and Doctor Billing systems. These small business systems are based on the BPS Database System nucleus, which includes an integrated on-line query and report generator as well as a complete Database Management System.

The new A/R system is designed to automate A/R and customer billing (in a typical ledger card environment) with minimum impact or disruption of current office procedures. All customer and accounting information is kept on-line, up

The New MSI SYSTEM 12



The MSI System 12 computer system combines the popular MSI 6800 processor ... complete with 56K of memory ... the MSI FD-8 QUAD floppy disk system, and the new MSI HD-8/R 10 megabyte fixed/removable hard disk system in one compact desk unit.

Ideal for business applications, the MSI System 12 gives you a large capacity hard disk for mass storage, and a floppy disk system for program loading, back-up, software updates and exchanges. System 12 will use MSIDOS, SDOS or FLEX operating systems. A variety of programs is available including Multi-User BASIC and a complete Management/Accounting package.

Complete with industry standard CRT and high speed printer, the MSI System 12 is one of the most powerful micro-computer systems available.

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CIRCLE 23

WHAT'S COMING UP

to date and available for immediate display through the integrated query system. Any kind of report can be created using the report generator (many useful reports are provided with the system). Itemized customer statements are printed on stock "easy mailer" break-open forms with return envelope included.

A complete audit trail of all system activity is maintained on-line, and all files can be rebuilt automatically. Many adjustments and changes to the system and its operation are possible without any re-programming.

The \$12,000 BPS system includes an Ohio Scientific Challenger III computer with dual, double-sided 8-inch floppy disks (1.2M), an upper/lower case CRT and a 125 lpm upper/lower case high quality dot matrix printer. The system can be expanded to include a 74 megabyte Winchester hard disk and multi-terminal operation.

Contact BPS North, 322 W. 57th St. #9C, New York, NY 10019; (212) 765-0815. Or contact BPS South, P.O. Box 10087, Houston, TX 77206. *Circle No. 60*

Intelligent Video Terminal System

Intertec Data Systems has introduced a new intelligent video terminal system, called the SuperBrain Video Computer, designed for small business systems applications. The SuperBrain is packaged in a single, lightweight, table-top enclosure. Standard features of the system include:

- Two double-density, 5 1/4" floppy-disk drives with 320,000 bytes of storage
- 48K bytes of user programmable RAM memory, on board expandable to 64K



- A CP/M based Disk Operating System with a text editor, an assembler and a debugger
- An S-100 bus adaptor to permit connection of auxiliary peripheral devices to the system
- Twin Z-80 microprocessors which allow efficient data transfer between the screen and peripherals
- A full ASCII keyboard with numeric pad and function keys
- A non-glare, dynamically focused 12" screen
- A universal RS-232C communications port for interfacing with an auxiliary printer and/or host computer
- A single board microprocessor design

• Intertec's new Video Power Supply, which combines both video and power circuitry on a single board

Software designed to operate on the SuperBrain's Disk Operating System includes BASIC, FORTRAN, COBOL and APL.

Price of the unit is \$2,995. Service for the system will be handled through Intertec's video terminal dealers and various independent third party service organizations. For further information, contact Intertec Data Systems Corporation, 2300 Broad River Road, Columbia, SC 29210; (803) 798-9100. *Circle No. 61*

New Computers and Peripherals

Schlumberger Products Corp. has announced its first group of five H/S Data System products, including five major devices.

The WH89 Packaged Computer incorporates two Z-80 microprocessors, a built-in 5¼" floppy drive, a video terminal (identical to the WH19 described below), a two-port serial I/O accessory and 16K bytes of RAM (expandable to 48K). Memory diagnostics are built-in and communication is EIA RS-232 Standard. Suggested list price is \$2295.

The WH19 "Smart" Video Terminal is a Z-80 microprocessor-controlled terminal with 25 × 80 character display format and commercial typewriter-style keyboard. All func-

tions are controlled by keyboard or software. Direct cursor addressing allows editing and correction at any location on the screen. Fully VT52 and ANSI-standard compatible, the WH19 features eight user-definable keys and includes a numeric keypad in calculator format for entry of arithmetic programs. Suggested list price is \$995.

The WH14 Line Printer prints the standard 96-character ASCII set (upper and lower case) on a 5 X 7 dot matrix print head. WH14 features sprocket feed, adjustable paper width, variable pitch and lines per inch, and selectable baud rates from 110 to 4800. The line-buffered printer interfaces via EIA RS-232C serial interface or 20 mA current loop. Suggested list price is \$895.

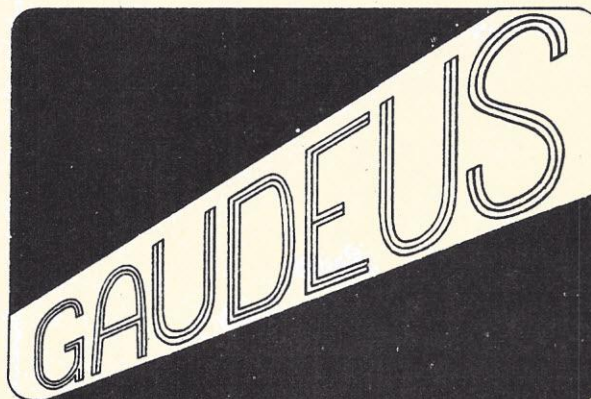
A 16-Bit computer, the WH11A utilizes DEC LSI-11/2 technology including the new KD11-HA CPU board. The WH11A is DEC PDP-11/03 compatible with up to 64K bytes of memory and comes complete with power supply and a backplane, which accommodates up to seven accessory cards besides the KD11-HA. The WH11A runs all applications software written for the PDP-11/03. Its disk operating system supports BASIC, Fortran and Assembler languages. Suggested list price is \$1895.

WH27, a floppy disk system designed for use with the H11A, incorporates a Z-80 microprocessor-based controller and has two 8-inch drives with a total capacity of 512K bytes. The WH27 uses standard IBM 3740 diskettes and is DEC

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*Change of price scheduled for September 1979.

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DR. DALEY'S SOFTWARE FOR THE PET

DR. DALEY's software continues to expand offerings. Listed below are our newest business offerings. With the new PET disk and printer these programs make sense for the small businessman. Dealers you should be able to increase your sales to the businessman by giving a demonstration of these programs. These programs are available NOW for the CompuThink disk and will be converted to the Commodore Disk as soon as DR. DALEY's gets one.

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This program will maintain a complete inventory for the small business. Functions include entering and editing of the new inventory, modifying individual records, closing out files for the end of the year inventory report, printing the current inventory and displaying the individual record. This consists of three programs capable of maintaining a complete inventory. With complete documentation. \$99.95

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CIRCLE 26

WHAT'S COMING UP

RX01 compatible. Included at no extra charge is an interface controller and bootstrap program. The WH27 Operating System (designated HT-11) includes the following programs: EDIT; EXPAND; ASMBLE and CREF; LINKER; LIBRARIAN; PIP; ODT; BASIC INTERPRETER; BASIC and miscellaneous other programs. Suggested list price is \$2595.

H/S Data Systems products will be marketed through select distributors and retail chains. For more information contact Schlumberger Products Corporation, Hilltop Road, St. Joseph, MI 49085. Circle No. 62

Business Computers with Bubble Memory

An expanded line of general purpose microcomputers has been introduced by Findex, Inc. Features include a BASIC-language operating system, bubble memory mass storage, upper- and lower-case alphanumeric plasma display and integral printer, in one compact, portable unit weighing less than 20 pounds.

System #128 incorporates 128K bytes of magnetic bubble memory for mass storage. The bubble memory can be ex-



panded in increments of 128K. This data storage technique offers high capacity in a small, stationary, light-weight package, the company said.

In the bubble memory, binary information is stored in magnetic garnet chip in the form of uniformly spaced magnetic domains, or "bubbles". These bubbles are arranged in closed loops, and the presence of a bubble in the loop represents a binary "one", whereas the absence of a bubble represents a binary "zero". The bubble memory has no moving parts, and retains stored information even if system power is disconnected.

As a lower-cost alternative to the bubble memory, Findex System #100 offers 90K bytes of mass storage in a mini-floppy disk housed inside the computer case. The floppy storage can be expanded to 400K. Built-in memory in this system is the same as in the System #128, and includes 48K bytes of dynamic RAM and 1K bytes of static RAM, expandable to over 2 megabytes, plus 8K bytes of ROM, expandable to 32K. External disk drives can be interfaced to the Findex for additional mass storage.

Findex also contains serial, parallel I/O and S-100 capability for interfacing with peripheral units, including external printers, cassette recorders, other Findex units and larger computers.

The computer uses a flat, gas plasma display panel instead of the usual CRT. The scrolling display provides six rows of

forty dot-matrix upper- and lower-case characters. The field of view can be scanned over any data base, making a large screen unnecessary for most applications, Findex said.

As a general business machine, Findex can automate accounting functions such as receivables, payables, general ledger and payroll, and can handle order entry, inventory control, sales analysis and many kinds of business reports.

Portability allows you to take the Findex to the jobsite or to locations previously considered impractical or impossible, the company said. For example, an insurance executive specializing in estate planning can design a program for the client right in the client's office, including the complex computations normally provided a day or two later by a big number cruncher.

Business executives, office managers and operation managers also can have a computer right on their desk to take care of orders, shipments and changes in inventory. Salesmen can have an extensive data base of models, prices, delivery dates, discounts and other relevant information with them on their sales calls. Retail stores can perform and store one or more days' transactions at each station for later transmission to a big computer. Bank tellers can have their own computers for versatile independent operation, but with the ability to interface with a central computer.

Other applications include scientific, engineering and design computations; take-offs and other computations required by contractors and architects; real estate listings and

transactions; tax consulting; parts and product distribution; and business operation of almost every type, Findex said.

The Findex is programmed in Business BASIC and also supports a Fortran and Cobol compiler. The computer includes a comprehensive file management capability and supports a large library of business applications programs.

Findex systems are priced from about \$5000 F.O.B. Los Angeles. Lease purchase arrangements are available for \$150 per month. For more information contact Findex, Inc., 1625 West Olympic Blvd., Suite 707, Los Angeles, CA 90015; (213) 7-FINDEX. *Circle No. 63*

Apple II for Arab World

Multi-Media Video, Inc., markets a bi-lingual Arabic/English version of the Apple II microcomputer. This system operates entirely in Arabic language (input, output, error messages and BASIC commands) and does not require knowledge of the English language, said the company.

Features include dual Arabic-English monitor, dual Arabic-English character generator, Arabic-English text selection, bi-lingual Arabic-English keyboard, Arabic-English commands and Arabic and English software programs. Price is \$2850.

For more information contact Multi-Media Video, Inc., 3350 Scott Boulevard, Bldg. 21, Santa Clara, CA 95051; (408) 727-1733. *Circle No. 64*



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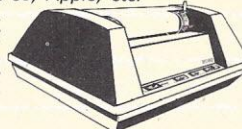
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WHAT'S COMING UP

PERIPHERALS

TRS-80 Interface to S-100 Bus

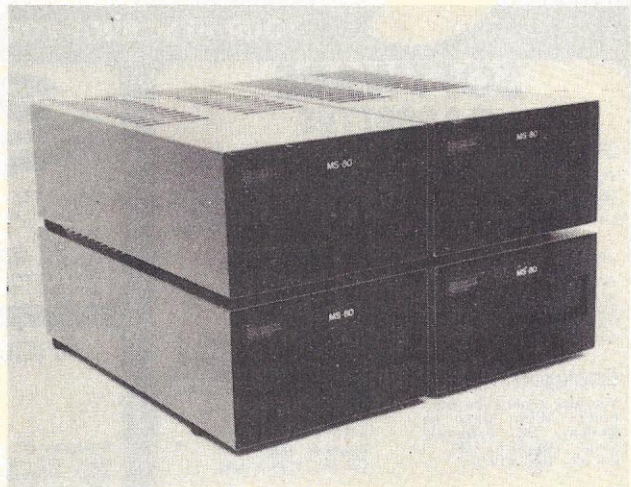
A new module for the TRS-80 allows complete software compatibility with S-100 bus microcomputers. Called the TRS-S100, the module converts TRS-80 timing and signals to S-100 requirements, permitting interface to a parallel printer and floppy disk controller, plus the addition of up to 32K of memory.

System capabilities can also be expanded to include speech, music and graphics or other enhanced displays. A TRS-80 expansion module is not required. Circuits are provided to allow Direct Memory Access as well.

The TR-S100 runs under CP/M with Fortran or a disk-based macroassembler. Price is \$225 retail. For more information contact Micro Computer Devices, Inc., 960 East Orangethorpe, Suite F, Anaheim, CA 92801; (714) 992-2270. *Circle No. 65*

TRS-80 Mini-Disk System

Matchless Systems has introduced the new MS-80 Mini Disk System for TRS-80, which includes a minifloppy disk drive, power supply, cable, regulator board and a compact case. The system increases usable storage capacity 23% from 55,000 to 67,800 bytes on the first drive, said the company. An additional five tracks are offered (40 rather than 35). MS-80 is completely compatible with the TRS-80 DOS.



Matchless advises that purchase of the MS-80 does not void the TRS-80 warranty. In fact, the MS-80 has a 90-day warranty. Users can mix and match the MS-80 with TRS-80 drives in any sequence or position.

Included in the \$395 price is the cable. The unit comes completely assembled and tested.

For more information, contact Mike Conner, Matchless Systems, Dept. PI, 18444 South Broadway, Gardena, CA 90248; (213) 327-1010. *Circle No. 66*

WHAT'S COMING UP

Ten Megabyte Mass Storage for Micros

A new 10 megabyte disk system has been released by Corvus Systems.

Plug compatible with the Radio Shack TRS-80, Apple, and other S-100 bus computers, the Corvus intelligent disk system adds cost effective mass storage while maintaining compatibility with existing hardware and software, said the company.



The system consists of a compact IMI 7710 disk drive employing proven Winchester technology with two eight-inch hard disks; a Corvus intelligent disk controller, Z-80 based, with comprehensive disk diagnostics; and an intelligent personality module and associated software for each type of computer.

Each drive has a capacity of 10 million bytes of formatted storage. Up to four drives can be supported in a simple daisy chain. Price of the system is \$5350, including disk drive, controller and personality module. Add-on disk drives are priced at \$2990. Delivery is 30 days ARO. For more information contact Corvus Systems, 900 S. Winchester Blvd., San Jose, CA 95128; (408) 246-0461. *Circle No. 129*

Video/Disk for Sorcerer

Exidy Incorporated introduced a Video/Disk attachment for their Sorcerer computer containing a 12" video display and dual mini-floppy disk drives with data storage capacity of 630K words. The swivel based unit attaches directly to the Sorcerer computer's keyboard enclosure.

The video display utilizes a P31 phosphor for readability and a 20 MHZ bandwidth for clear pictures. Software included with the hardware consists of the CP/M operating system, Z80 Assembler, text Editor, linking Loader and Microsoft Disk Extended BASIC.

Video/Disk costs \$2995 retail and is available 30 days ARO. For more information contact Exidy Data Products, 390 Java Drive, Sunnyvale, CA 94086. *Circle No. 118*

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CIRCLE 30

Apple II Speech Synthesizer

Computalk Consultants announced a new speech synthesizer adapted specifically for the Apple II microcomputer. The Model CT-1A Speech Synthesizer is a completely self-contained system. It comes with its own 14" x 4" x 7" chassis and 110 VAC power supply. Internally, the single interface circuit board contains an onboard 2 Watt audio amplifier, an S-100 adapter for the CT-1 Speech Synthesizer board, and an Apple II compatible edge connector. An interconnect cable and Apple controller card, detailed manual and software package (cassette or disk) completes the package. Standard phono jacks provide connections for external speakers, headphones or hi-fi amplifier.

The high quality voice generator operates with the Apple II microcomputer equipped with a minimum of 16K RAM (32K recommended). It is controlled by nine acoustic-phonetic parameters transmitted on the microcomputer bus. These parameters control the perceptually and physiologically fundamental aspects of speech as determined by contemporary phonetic research, the company said.

Model CT-1A can be operated in two modes: Direct Parameter Control and Phonetic. Each unit is shipped with an easy-to-follow hardware user manual and software package containing speech parameter data files Hello, Letters, Digits, and the Computalk CSRI Synthesis-by-Rule software pro-

gram. All software is available in a choice of 5-1/4 inch diskette or standard cassette.

Suggested retail price is \$595 and includes the self-contained unit, interconnect cable, Apple controller card, user manual and software. A special unit is available for persons who already own a Model CT-1 and wish to adapt it to the Apple II microcomputer.

Computalk Consultants is making a limited special introductory offer of the Model CT-1A for \$495.

For additional information contact Computalk Consultants, 1730 21st St., Suite A, Santa Monica, CA 90404; (213) 828-6546. *Circle No. 106*

Low-Cost Impact Printer for Personal Computers

A versatile, low-cost impact printer featuring a graphics option, eight software-selectable character sizes and multiple forms printing capability was introduced by Integral Data Systems.

Model 440 Paper Tiger printer costs \$995 and interfaces to the Apple II, TRS-80 and other personal computers. This new commercial-grade tractor-feed printer features an optional DotPlot graphics package providing full dot plotting capability at low additional cost.

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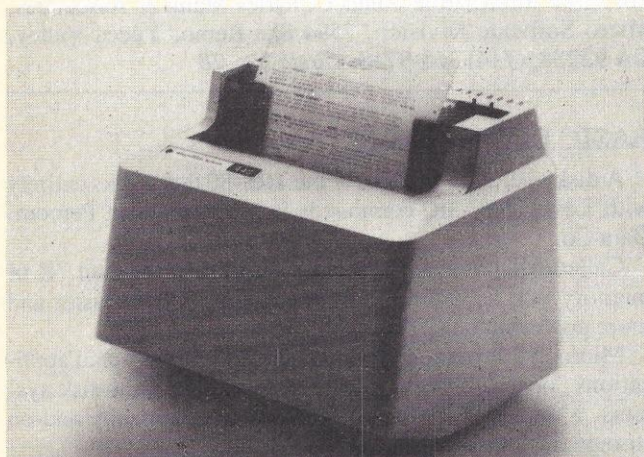


WHAT'S COMING UP

dot control. With the ability to manipulate every matrix dot on the printed page, a wide range of graphics — from bar codes and block letters to complex illustrations — can be printed. The 2K buffer, included with the graphics option, holds a full CRT screen — 1920 characters. The 2K buffer/graphics package is priced at \$199.

Standard features include: upper and lower case character set; adjustable form width; forms control with eight standard form lengths; both 80 and 132 column formats; choice of six or eight lines-per-inch vertical spacing; software-selectable character density; automatic multi-line buffering; and both RS-232C serial and Centronics-compatible parallel interfaces. Multiple transmission rates from 110 to 1200 Baud are also switch selectable.

Variable character size permits program controlled highlighting and formatting of copy. The size of even a single character can be controlled. Using a smaller character size, up to 132 columns per line can be printed on 8½ inch wide paper. When using enhanced mode characters, the Paper Tiger smooths out character diagonals, curves and intersections, providing improved legibility, the company said.



Conveniences to simplify forms handling include: precise, electronically-incremented forms alignment at the touch of a switch; switch-selectable, variable forms length; perforation skipping; and adjustable pin feed tractors which permit a forms width range from 1.75 to 9.5 inches.

The new printer handles multi-part forms. Unlike other low-cost printers which require thermal or electro-sensitive paper, the Paper Tiger uses ordinary paper. With internally held roll paper or 9½ x 11 inch fanfold forms, the printer plus forms require less than 1.75 square feet of desk space. The printer weighs less than 20 pounds.

The Paper Tiger's printhead is rated at over 100 million characters. Reliability is enhanced, by computerized manufacturing test procedures and a fully functional factory burn-in of every Paper Tiger are two levels of self-testing. An automatic test to verify the integrity of the printer's memory and electronics is initiated every time the power is turned on; and a full print capability test can be operator initiated.

For more information contact Integral Data Systems, Inc., 14 Tech Circle, Natick, MA 01760; (617) 237-7610.

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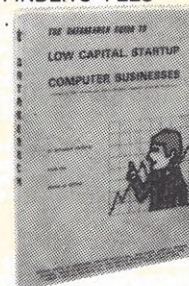
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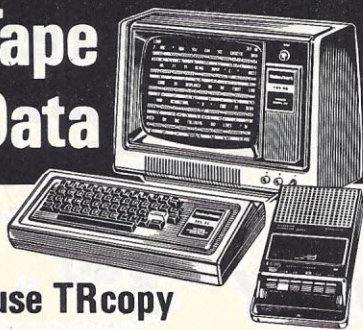
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CIRCLE 33

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use TRcopy WITH YOUR LEVEL II TRS-80*

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COPY ANY CASSETTE TAPE**

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YOU CAN SEE THE DATA

As the tape is being loaded, you can SEE the actual data byte-for-byte from the beginning to the end of the program. Up to 320 bytes are displayed at one time. ASCII characters are displayed on the first line and hexadecimal code is displayed on the following two lines. Data is displayed exactly as it is input including memory locations and check sums.

IDENTIFY PROGRAMS

With TRcopy you can identify programs on cassette tapes without written documentation because you can SEE the filename. If you forget to label a tape, you can use TRcopy to display the tape contents and identify the cassette.

VERIFY CASSETTE TAPES

With TRcopy you can verify both the original tape and the tape copies. You can make certain that your machine reads the original tape correctly and that it makes byte-for-byte copies. TRcopy also counts as it reads giving you the exact length of the data.

MAKE BACKUPS FOR YOUR PROGRAMS

Now you can make backup copies of your valuable programs. Many times a cassette that you make will load better than one that is mass produced. The original can then be kept as a backup in case the copy is damaged.

MAKE COPIES OF YOUR SOFTWARE

If you are in the software business you can use TRcopy to make tested copies of your programs for sales distribution. TRcopy produces machine language tapes that are more efficient than those produced by the assembler itself.

RECOVER FAULTY DATA

With TRcopy you can experiment with the volume and level controls and you can SEE what the computer is reading—even if your computer will not read the data through normal read instructions! In this way it is possible to read and copy faulty tapes by adjusting the volume control until you SEE that the data is input properly.

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The TRcopy system is a machine language program with documentation explaining tape leaders, sync bytes, check sums and other formatting conventions. With the TRcopy system, you can SEE what you are doing!

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WHAT'S COMING UP

SOFTWARE

Computer-Aided Teaching Programs for Apple II

Charles Mann & Associates has announced two new computer assisted teaching program packages for the Apple II computer.

Floating Point dictionary is designed as a teaching and reference program for Apple's Floating Point BASIC. The program defines all BASIC commands and provides operating examples of the use of all system commands. The design includes a permanent reference library on the uses of the BASIC commands.

Total BASIC Teaching Pac offers, in addition to the Floating Point Dictionary, a 13-lesson course in BASIC programming. Both programs include working examples for all Apple graphics capabilities. Advanced programmers will find details of memory registers helpful to more complex applications.

The programs are available from dealers for under \$50. For more information contact Charles Mann & Associates, Micro Software Division, 7594 San Remo, Yucca Valley, CA 92284; (714) 365-9718. *Circle No. 78*

BASIC DOS for TRS-80

A disk operating system for the TRS-80 that works entirely with Level II BASIC commands is available from Percom Data Co.

Called Microdos, the program resides in less than 7K of memory yet, according to the company, is both faster and more powerful than TRSDOS.

Microdos, developed for business and professional applications, operates the Percom TFD series of mini-disk systems, a family of small, medium and large capacity add-on storage devices for the TRS-80.

Microdos is supplied on a system diskette that also includes three BASIC programs: (1) file management; (2) disk utility, which illustrates how disk utilities may be written with only a few BASIC statements; and (3) sample application entitled "The Percom 5-1/4 Inch Notebook", an expandable disk-based notebook of information about Microdos disk BASIC statements. The notebook may be easily accessed or changed by the user.

Microdos permits use of hexadecimal constants in expressions, and the user may add up to 10 of his own special functions to existing functions.

The system diskette, which includes the operating system, BASIC programs and program menu, sells for \$29.95. It is included free, however, with the purchase of one of the large capacity TFD-1000 storage units. Versions are available for all TFD models.

Orders may be placed by dialing Percom's toll-free number, 1-800-527-1592, and may be paid by check or money order, COD or charged to Visa or Master Charge. Texas residents must add 5% sales tax.

For more information contact Percom Data Co., 211 N. Kirby, Garland, TX 75042; (214) 272-3421. *Circle No. 79*

CIRCLE 34

Business Software

Four new software programs from Graham-Dorian Software Systems include Accounts Receivable, Accounts Payable, General Ledger and Job Costing.

The new programs tie together, so users can start with one and add others as desired. On-line capabilities enable an operator to make a single entry and update all affected files. An inquiry into a file at any time provides up-to-date information with no batching or sorting of input data.

Messages on the video display guide the operator each step of the way, making the programs easy to use, the company said. An invalid operator request or invalid data entry produces an error message immediately.

The new packages are compatible with Northstar, Imsai, Altos, Cromemco, Industrial Micro Systems, Radio Shack TRS-80, SD Systems, Digital Microsystems, Dynabyte DB8/2, Micropolis MOD II, Vector MZ and other 8080, 8085 and Z80-based systems.

Accounts Receivable records invoices, prepares statements and trial balance reports, and automatically reports aging of accounts in periods of 30, 60 and 90 days, with each item listed separately.

Accounts Payable provides for vendor lookup and change, entering vendor invoices, writing checks, cash flow analysis, accounts payable check register and vendor list.

General Ledger includes lookup and change, making journal entries, trial balance, transaction register, chart of accounts, financial statements and monthly closing.

Job Costing provides work order lookup, enters labor transactions, material set-up, progress report of hours, labor distribution report, weekly labor reset and actual versus estimated cost per job.

For more information contact Graham-Dorian Software Systems, 211 N. Broadway, Wichita, KS 67202; (316) 265-8633. *Circle No. 80*

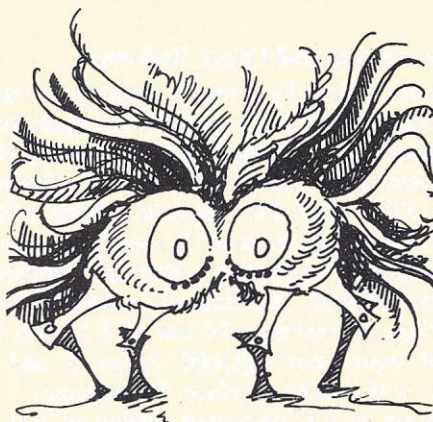
Legal Time Accounting Software

A new Legal Time Accounting Software Package, which runs on PolyMorphic 8813 desktop microcomputers, will handle legal timekeeping and billing for law offices having up to 12 attorneys. The program, from 21st Century Software, is command driven and allows the clerk or secretary to enter client and case information, which the computer organizes and stores for later retrieval. The package completely automates client timekeeping and billing, and can be modified to print reports.

The software takes advantage of the 8813's memory mapped video display, transforming the system's keyboard and video monitor into a control panel from which the secretary or clerk operates the system, said the company. The system was programmed to allow simple expansion of modification to suit individual requirements. A comprehensive user's manual provides local programmers with information for customizing or adding enhancements.

Price is \$800. Firms presently using the 8813 for word processing can upgrade their computers to run the LTA package. Contact 21st Century Software, 2201 Carew Tower, Cincinnati, OH 45202. *Circle No. 81*

Science Fiction



Turn your daydreams and visions of the future into cash. We're looking for short (500 to 2000 words) science fiction stories dealing with the future of microcomputers - their possible uses and their roles in society and in people's lives. Stories must be original and not published elsewhere. Submit your typed, double-spaced manuscript to Personal Computing, 1050 Commonwealth Ave., Boston, MA 02215.

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Dept. PC

Word Processor and Other Software

Southwest Micro-Systems has changed the name of their word processor along with expanding its capabilities, and has added to their line of software for the North Star Horizon.

The Alphasmith, formerly Wordsmith, is designed to run on a 32K North Star Horizon system with a Soroc Hazeltine or Intertube terminal. It uses the advanced features of these terminals to provide a simulated memory-mapped editing environment. Justification, provided through variable spacing, necessitates the use of a Diablo HyType II printer or equivalent (QUME Sprint 5 and the NEC Spinwriter with Diablo interface, for example).

In addition to full on-screen editing of text, complete cursor control, block movement and deletion, and other editing functions, Southwest Micro-Systems now provides automatic carriage returns, insertion of name, addresses and other data (up to nine fields) from a separate datafile, automatic page numbering and four different automatic paragraph options.

Simplified disk control helps the operator to read, write and modify disk files. Creation of data files which can later be inserted into documents is also handled by Alphasmith, and any document you write can be inserted into another as a standard paragraph. Multiple document files can be appended together so entire books can be printed in a single pass.

The Alphasmith sells for \$299. Documentation alone can be ordered for \$25 deductible from eventual purchase.

Wizard allows you to save North Star BASIC programs in text format so you can use your favorite text editor to modify your programs. All tokens, line numbers and other abbreviations are expanded to their full ASCII format. With the Wizard you can have all the convenience of North Star BASIC with all the power of the most powerful text editors, said the company.

The Wizard will run on any North Star MDS based system that has memory addressed from location 0 Hex. It is available immediately for \$19.95 plus \$2 handling and postage. California residents add 6% sales tax.

For more information contact Southwest Micro-Systems, P.O. Box 20088, Riverside, CA 92516. *Circle No. 72*

Tiny Pascal

Now your TRS-80 can run Pascal too. The Chung/Yuen "Tiny" Pascal, fully implemented for the Level II, 16K TRS-80, includes:

- "Tiny" Pascal compiler
- Complete text editor for writing programs
- Complete "Tiny" Pascal monitor
- Sample Pascal programs
- User's manual

"Tiny" Pascal is both powerful and fast, said the company. Programs will execute at least four times faster than BASIC.

For the serious hobbyist, side two of the cassette contains a larger compiler and complete source to the compiler written in Pascal. You can re-compile the compiler, making changes and adding features, a procedure requiring at least 36K

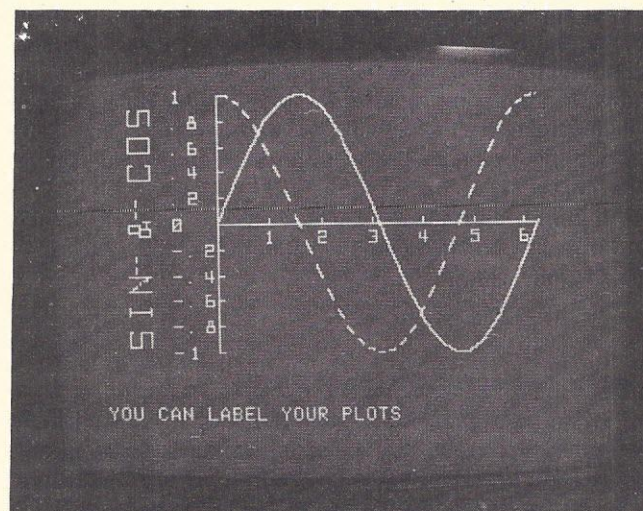
RAM.

"Tiny" Pascal features include: recursive procedure/functions; FOR(LOOP); CASE; IF/THEN/ELSE; one dimensional arrays; WRITE; READ; CONSTANT; REPEAT/UNTIL(LOOP); PEEK and POKE; PLOT (graphics for TRS-80).

Price is \$40. For more information contact Supersoft, P.O. Box 1628, Champaign, IL 61820. *Circle No. 73*

Apple II Programming Aids

The first in a series of programmer's aids from Futureworld for the Apple II computer is a set of Applesoft II BASIC subroutines. The subroutines, called x,y Genesis, help place points, lines, shapes and labelled x and y axes on the high resolution graphics screen. The full capabilities of the screen can be realized by incorporating plotting areas smaller than the full screen or placing labels on the screen. The plotting subroutines catch situations where a drawing goes beyond the edge of a defined plotting area. They draw up to the edge and no farther. When the drawing re-enters the area, the plotting continues at the edge. Plotting can be automatically scaled so graph units have equal lengths in any direction on the screen; or the graph can be expanded to fill a plotting area of any rectangular shape.



According to the company, x,y Gensis allows a programmer to think in terms of a finished high resolution screen rather than the techniques for plotting such a screen. This system keeps your BASIC programming short and simple, but the effects generated can be big and fancy, said the company.

Other programs included in the system allow the subroutines to be added to an existing program and help create tables of high resolution shapes. Futureworld also supplies a shape table, including all keyboard characters plus some special symbols and demonstration programs.

The subroutines were designed for use on a 32K Apple II computer with Applesoft II firmware card and disk drive. The introductory price is \$99.95.

For more information contact Futureworld, 2514 University Drive, Durham, NC 27707; *Circle No. 74*

TRS-80 Games

Cybermate offers several programs for the TRS-80. Maze/1 randomly generates a maze with user-selectable complexity. Level II BASIC and 4K are required.

YG/1 allows up to 7 players to challenge the TRS-80 to a game of Yahtzee. Level II BASIC and 16K are required.

CP/1 generates crossword puzzles on the screen using a dictionary of user-supplied words. The player must then fill in the crossword puzzle form. Level II BASIC and 16K are required.

Checkers challenges the user to a game of checkers with the board displayed on the screen. Level II and 16K are required.

All programs are on TRS-80 C-20 cassettes and each tape is CLOAD tested. Price for all programs is \$5.95 each with a 10% discount on orders of 2 or more programs. Source listings for the programs are \$2 each.

For more information contact Cybermate, R.D. #3, Box 192A, Nazareth, PA 18064. *Circle No. 35*

Adventure II Fantasy Game

Adventure II is a computer game involving fantasy worlds, wondrous creatures, precious objects and esoteric knowledge, according to Songana Co. Mapmaking skill and explorer instincts are the surest guide. With practice, you move with increasing confidence through mysterious passages, perform daring feats and discover priceless treasures. As you advance closer to Ultimate Knowledge, the challenges grow more difficult, but the rewards keep pace. Adventure II pits players against the fantasy world, not against other players or the computer.

The game is designed to run on most popular home computer systems as well as the IBM System/34. The game's prices vary from \$50 to \$100 depending on system. For further information contact Songana Co., P.O. Box 2328, Framingham, MA 01701. *Circle No. 76*

Pascal for TRS-80

UCSD Pascal, the general purpose programming language designed by Professor Niklaus Wirth and improved by Kenneth L. Bowles, is available from FMG Corp. for the Radio Shack TRS-80.

Pascal is relatively easy to learn, though its real advantage becomes more obvious as programming difficulty increases. Pascal is a developmental tool designed for both the programmer and the user. No other programs or languages are needed to run Pascal.

The package, including a compiler, a Z-80 assembler and a screen editor, is capable of running most business applications such as word processing, payroll, accounting and bookkeeping, the company said.

The system supports up to 4 mini-disks, line printer and RS-232. It also supports user implemented peripherals.

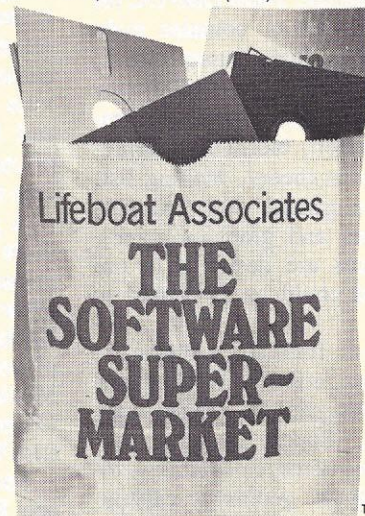
The package is priced at \$150. For more information contact FMG Corporation, P.O. Box 16020, Fort Worth, TX 76133; (817) 294-2510. *Circle No. 77*

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ANNOUNCING

TRS-80* PEOPLE'S PASCAL

"Tiny" Pascal, runs on any 16K Level II system, includes the programming structuring capabilities of full Pascal, but not data structuring.

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Disk Software for TRS-80

National Software Marketing Inc. has released Super disk software packages for the TRS-80.

Super disk-1 contains 42 programs for \$13.95, including the cost of a floppy disk and mailing. Super disk-1A, for a single disk system, contains eight fewer programs than Super disk-1, which is designed for a dual floppy configuration. Programs include inventory, amortization, biorhythm, depreciation, decision theory, mailing list, payroll, space games, racing games, strategy games and graphics games. Some programs are designed to use tape files that could be converted to disk.

Super Disk-2, for mathematicians or business people, contains 70 programs for \$13.95. Designed for a dual floppy configuration, Super Disk-2's programs include interest calculations, investment analysis, geometric calculations, trig calculations, statistical analysis, depreciation and conversions. Super Disk-2A is designed for a single floppy disk system and contains fewer programs.

For more information contact Elliot Kleiman, National Software Marketing, 4701 McKinley Street, Hollywood, FL 33021; (305) 625-6062. *Circle No. 114*

Lower Prices for Program Cassettes

Interact Electronics has reduced prices on all its program tapes as well as introduced a new series of applications for personal finance management.

The five-tape Personal Finance series includes Financial Library I, a program which can be used to manage a stock portfolio with the capability of reporting gains and losses, P/E ratios and yields; and Financial Library II, designed to analyze and forecast trends, as well as to evaluate savings and borrowing options and compute net worth.

The Calculator tape, also part of the series, turns the Interact computer into a four-function calculator with the ability to self-correct. Users who make a mistake at any point can correct the error without having to re-enter the entire series of figures. The program will

automatically make the correction and re-tally the result.

The Checkbook Balancer helps you reconcile the bank's monthly statement with your own records. It can also prepare a data tape for the Household Budget program, — a three program system used to plan a budget, analyze actual expenditures and track progress against the plan. Household Budget sells for \$19.95. Financial Library I and II and Checkbook Balancer are priced at \$14.95. The Calculator tape retails for \$8.95.

A package of 12 different entertainment and educational tapes is now priced at \$59.95, or \$8.95 each. Six other tapes, including Microchess and Backgammon (which both pit the player against the computer) and the Music Maestro (which allows the user to compose music), will now retail for \$14.95 each.

For more information contact Interact Electronics, 2548 Packard Rd., Ann Arbor, MI 48104. *Circle No. 116*

Self-Indexing Data Bus System

"Wow! How'd All That Stuff Get In There?" (WHATSIT?) is a self-indexing query system now available for Apple users. Introduced by Computer Headware, the system's applications include indexing investment portfolios, music or hobby collections, customer lists and household or professional files. WHATSIT features a typical response time of 2 to 10 seconds, and conversational updating of stored information.

The system answers typed-in questions by referring to disk data that it automatically stores and revises, as instructed in short "pidgin English" sentences.

A WHAT'S NEXT request provides assisted operation, with automatic prompting. Also new is the Soundex request, enabling WHATSIT to recognize entries that sound right, even when spelled incorrectly — handy when trying recall an unfamiliar name or other entry, according to the company. And besides squeezing about 2000 entries onto an Apple disk, WHATSIT cross-indexes them automatically under any desired heading, the company said.

Unexpected new headings are added to the file when first mentioned, and

remain available for future reference. Obsolete headings are eliminated.

Supplied on an Apple disk, WHATSIT comes with a 150-page manual containing step by step instructions and numerous examples. Models are also available for North Star and CP/M systems. Apple II and North Star models are priced at \$100; CP/M for \$150.

For more information contact Computer Headware, P.O. Box 14694, San Francisco, CA 94114. *Circle No. 120*

North Star Software

A Time-Share System and an Executive Package for the North Star are available from the Byte Shop of Westminster.

The Northshare Disk Based Time-Share System for the North Star Floppy Disk System is now available for both release 4 (single density) and release 5 (double density) machines. A floating point version for release 5 is also available. Designed to operate with either 8080 or Z-80 processors, Northshare provides up to four independent users with selectable memory partitions and buffered terminal outputs. Minimum system memory requirements for operation are 24K bytes.

The system includes one diskette with release 4 or 5 (please specify) North Star Basic and DOS with the Northshare supervisor and documentation package. Price is \$49.95.

XEK, a disk-based North Star Executive Package, consists of an Assembler, Disassembler, Debugger, Monitor and line-oriented Editor. Provisions are made for six active source files in RAM with the usual mass storage on disk. The Assembler generates object code that may be located anywhere in memory and a listing of either the complete source list or only source lines with errors. Special commands are included for file handling and recovery. The Disassembler provides commands for ASCII and hexadecimal memory dump, cross reference symbol table, list formatted or unformatted and disassemble from specific memory address. The Disassembler can also disassemble into Assembler-compatible files, allowing you to relocate a ROM monitor or add a new device to the DOS I/O routines. The Editor has an "auto-

line" feature to simplify source generation.

The system is provided on mini floppy disk (please specify starting address) and includes an extensive Command Definition Manual. Price is \$49.95. For more information contact Byte Shop of Westminster, 14300 Beach Blvd., Westminster, CA 92683; (714) 892-0500. *Circle No. 122*

Educational and Game Software

Program Design, Inc., offers educational and games software for the Apple, Pet and TRS-80.

Minicrossword (for the TRS-80 Level II and Apple II) forms minicrossword puzzles from a pool of over 450 words. Dozens of completely different puzzles are possible. The computer gives clues and scores you on how well you solve the puzzle. There are 2 crossword games and 2 Codeword puzzles on the tape. The 4 programs together help improve vocabulary and spelling skills, the company said. Price is \$14.95.

Spelling Builder is for high school students and adults who have mastered basic spelling but still have trouble deciding whether it's "digestible" or "edible", "supersede" or "supercede". Not just drill, this series of programs actually teaches you how to handle difficult words, according to the company. A computer tape and an audio tape are included in the price of \$18.50. The program is available for TRS-80 Level II and Apple.

Memory Builder, Story Builder and Code Breaker are 3 educational games for the Apple, Pet or TRS-80 Level II.

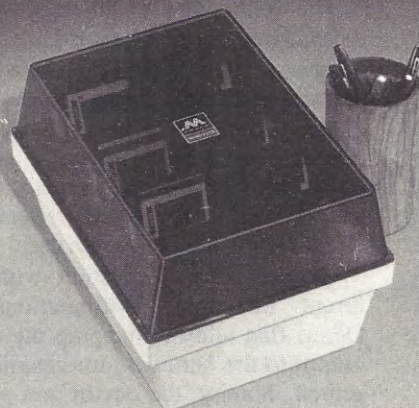
Memory Builder, a Concentration-type game, helps kids improve memory and attention span. Story Builder writes short stories with the child to help improve grammar and vocabulary. Code Breaker gives scrambled messages for players to decode, helping improve basic writing skills, the company said. (Code Breaker is not available for TRS-80 Level II.) All courses are \$13.50.

One additional program — Morse Code Game — is for the Pet only. It turns the Pet into a Morse Code sounder and gives players practice in decoding messages. The program comes with a plug for the computer; the user supplies

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CIRCLE 40

an inexpensive 6-volt buzzer. Price is \$14.95.

The programs are available from Computerland and other dealers. Contact Program Design, Inc., 11 Idar Court, Greenwich, CT 06830; (203) 661-8799. *Circle No. 70*

Software for Statistics, Finance and Business

Basically Speaking announced two new software offerings. For TRS-80 and Exidy users, Statpak and MoneyOne are now available on cassette for \$11.95. Statpak has five programs — ANOVA, T-test, Linear Correlation, Analysis of Covariance and Generalized Statistics. MoneyOne consists of four programs — Loans, Networth, Budget and Checkbook.

The second new offering, for Micropolis and Micropolis CP/M users, consists of three business packages. The first is a complete Accounts Receivable and Accounts Payable package for \$95. Inventory, a customizable program, allows the user to specify what data are kept on inventory items. Postman, a mailing list and label program, includes room for fields such as job title, company name, foreign postal codes, remarks and identification numbers. Inventory and Postman are \$45 each, or \$85 if ordered together.

All software includes full documentation, quality media and periodic updating. For more information write Basically Speaking, 719 Anna Lee Lane, Bloomington, IN 47401. *Circle No. 71*

Book Inventory/Database Program

A software package called Books.Bas, which runs on CP/M systems with CBASIC-2, has been released by Holliday Software. The program files and maintains an inventory of books or other data on a disk.

The program requires a minimum of 24K of contiguous RAM (32K or more is recommended), at least one floppy disk drive and a terminal/keyboard. Control codes output by the program to clear the screen and skip printer pages can be changed at run time.

A number of special features are designed into the program. For example,

it's not necessary to remember or look up any commands since the program is menu driven. An English language selection menu is presented when an operator response is required. The user types in the desired command to use any of the functions.

The field names are not fixed but are defined by the user when creating a new database. The lengths of the data fields are also variable and can be set to any length whenever a new database is created. In addition, several of the fields are used for the print menu and for report titles, which effectively 'customizes' the file for the user.

Options allow operation with different hardware configurations. A Demo flag allows changing the codes output to the hardware for clearing the screen, homing the cursor and printer form feed. A Debug flag prints a message each time the files are accessed.

Documentation includes a user manual which describes available functions (Add, Change, Create, Delete, Find, Index, Option and Print) and includes sample runs for each. File organization and database structure is also described.

The software is distributed on an 8" diskette in CP/M format and includes user manual, run time modules (INT files) and sample data base. Suggested price for the package is \$19.95. Documentation is available separately for \$5. A complete package with source listings and code is \$49.95. For more information contact Holliday Software, 4807 Arlene St., San Diego, CA 92117. *Circle No. 67*

COMPLEMENTS

Personal Computing Cassette

A cassette designed for personal computers has been introduced by 3M's Data Recording Products Division. The Scotch 830 personal computing cassette is designed for use with computers such as the Apple and the Commodore Pet. Available in both 10-minute and 30-minute lengths, the cassettes are individually packaged in plastic album cases. Suggested price for the 10-minute album is \$2.10; for the 30-minute album, \$2.33.

For more information, write Department DR9-2, 3M, P.O. Box 33600, St. Paul, MN 55133.

Circle No. 68

Short-Length Cassettes

Elliam Associates' Shorty cassettes use Scotch brand high output, low noise tape that is treated to provide uniform winding. This tape is loaded in a five-screw take-apart shell with spring-loaded pressure pad and nylon rollers to guide the tape accurately.

The cassettes come in a hard plastic box. Space is provided on the label for 12 recorder counter start and end readings, as well as room for each program name. Side 1 and Side 2 are preprinted and space is provided for a tape number. Price is 10 for \$13.50 and 20 for \$26.00. Elliam Associates also handles a line of computer and word processing supplies. Send \$2 for big catalog and \$2 off coupon to Elliam Associates, 24000 Bessemer St., Woodland Hills, CA 91367; (213) 348-4278. *Circle No. 69*

Proportional Space Printwheel Family

Qume Corp. has introduced a family of English-language proportional space printwheels for use with Qume daisy-wheel printers and data terminals equipped for proportional spacing.

The family consists of seven typefaces: Modern, Arcadia, Thesis, Title, Boldface, Boldface Italic and Essay Italic. Each printwheel has a 96-character set that includes complete punctuation and numerals. All are interchangeable with one another to provide maximum flexibility, the company said.

In proportional space printing, character centerline distances vary depending upon character size; for example, the letters "i" and "w" are allocated different amounts of horizontal space, unlike traditional monospace printing that allocates all characters the same space.

Proportional space printing is more legible and aesthetically pleasing, and simplifies precise character positioning for line justification, Qume said.

Pricing of the proportional space printwheel is similar to that of the company's other printwheels, with off-the-

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So why not share your solutions with our readers? Send us an article describing the problem you faced and how you used your microcomputer to solve it. Be sure to include a program description, program listing and sample run.

Remember, readers aren't familiar with your program. So explain in detail what the program does and how it does it. Include here the overall structure of your program as well as any special algorithms or routines you've used. Give suggestions for modifying or expanding the program for other applications, other businesses or other situations.

All submissions should be original, typed (not all CAPS), double-spaced and neat. Include your name and address on the first page of the article and enclose a self-addressed, stamped envelope for return of material. Also, please use a fresh ribbon on your printer for program listings and sample runs.

Feel free to call us at (617) 232-5470 if you have any questions or want to discuss specific article ideas.

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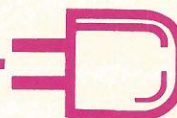
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CIRCLE 44

WHAT'S COMING UP

shelf availability. For more information contact Qume Corp., P.O. Box 50039, San Jose, CA 95150; (408) 942-4000.

Non-Electric Cassette Tape Eraser

A Non-Electric Cassette Tape Eraser for computer use has been introduced by the Data Products Division of Robins Industries Corp.

Designed to erase digital, standard and micro/mini cassettes, the unit requires no power or batteries.

The eraser operates with built-in magnets which produce a strong demagnetizing field. It removes recorded data in seconds and background noise levels are reduced to below normal erase head levels, the company said.

The Cassette Tape Erase carries a net price of \$15.50. For more information, contact Samuel Jones, Sales Manager, Robins Data Products Division, 75 Austin Blvd., Commack, NY 11725. Circle No. 82

generated with the TRS-80 editor/assembler.

JFF's base PC board, priced at \$49.95, comes with a documentation manual that includes schematics, circuit theory, parts list and sample software. Contact JFF Electronics, 001 CN Towers, Saskatoon, Canada S7K 1J5. Circle No. 83

Micromodem for S-100 Computers

Micromodem 100, a complete data communications system for S-100 microcomputers, combines on a single board functions which formerly required a modem, an automatic calling unit and serial and parallel interfaces. The new board is a computer-to-computer or terminal-to-computer modem for small computer systems.

Developed by D.C. Hayes Associates, the system is fully S-100 compatible, including 16-bit machines and 4 MHz processors.

Micromodem 100 converts digital data into analog signals for transmission over regular voice telephone lines. Because it is a Bell System 103 compatible modem, it can communicate with the most commonly used modems in North America. The unit operates at either of two software selected baud rates — 300 baud and a jumper-selectable speed from 45 to 300 baud. It is equipped with an FCC-registered Microcoupler data access arrangement which feeds the signal into the telephone line through a modular connector provided by the local telephone company. This direct connect feature allows the Micromodem 100 to automatically answer the phone or dial a number.

Use of the Microcoupler provides direct access to the telephone system without the losses or distortions associated with acoustic couplers and without a telephone company supplied data access arrangement.

Applications include use as a data communications tool between home and office, an automatic data collector from remote terminals and an intelligent terminal. The unit allows implementation of remote software maintenance and customer support. It sends programs, letters and other data over the telephone and provides access to remote data bases.

P.C. BOARDS

Color Graphics for TRS-80

TRS-80 owners can now have a high resolution color graphics interface using a PC board developed by JFF Electronics. Geared to the hobby computer market, the low cost board offers software selectable operating modes. The high-resolution mode can display 128 × 192 matrix in one of two sets of four colors or it can be traded off to 256 × 192 maximum resolution in two colors. In lower resolution, modes of up to eight colors are available. Characters are alphanumeric in two colors and reverse video.

The PC board has its own board-regulated power supply and connects directly to a TRS-80 keyboard with no expansion interface required. A standard color video signal is generated and the system connects directly into the color monitor video input or a standard TV set equipped with an RF Modulator.

You can use the board with Level II BASIC PEEK, POKE and OUT commands or Level I BASIC using T-Bug or with the machine language routines

Micromodem 100 is software compatible with the D.C. Hayes Associates 80-103A Data Communications Adapter.

The unit is available at local computer stores. For more information contact D.C. Hayes Associates, Inc., 16 Perimeter Park Drive, P.O. Box 9884, Atlanta, GA 30319; (404) 455-7663. *Circle No. 84*

Audio Spectrum Analyzer

Eventide Clockworks offers a real-time audio spectrum analyzer for the Commodore Pet computer. The analyzer divides the audio spectrum from 20 Hz to 20 KHz into 31 third-octave bands, and displays those bands, with their relative amplitudes, on the Pet screen. The unit can be used for measuring sound and noise levels, for optimizing the equalization of a hi-fi or public address system, for checking the frequency response of audio components, and for speech and sound pattern recognition.

The Pet can store and recall spectral data, and compare them with past, future or other channel data. A Peak Hold feature enables the unit to determine whether any preset levels have been exceeded. Programs to access the analyzer are written in BASIC. Three are provided with the unit: Interactive Operation, Self Test and Minimal Operation.

The analyzer is a single-circuit board, which installs in about five minutes inside the Pet. It has 31 third-octave filters, detectors, an analog-to-digital converter, a 1K Read Only Memory which contains machine language routines, and the necessary peripheral circuitry for transferring data into the Pet memory. The board draws its power from the Pet transformer. Price is \$595. Contact Eventide Clockworks, Inc., 265 West 54th St., New York, NY 10019; (212) 581-9290. *Circle No. 85*

Apple Real-Time Clock

Dubbed the Appletime, the Model APT-1 is a real-time clock for the Apple II computer. Six-digit time information can be displayed on the screen and printouts or used for timing events, controlling other peripherals, data log-

ging, and so forth. Included with this peripheral board is an external wall transformer which keeps the clock running when the computer is turned off. Other features include: 12/24 hour, AC/crystal timebase, and BCD or ASCII data format. Appletime plugs into any slot of the Apple II and can be used with machine language or BASIC programs. Price of \$79.95 includes (U.S.) postage and handling. Contact West Side Electronics, P.O. Box 636, Chatsworth, CA 91311. *Circle No. 86*

16K PROM Card

Artec Electronics, Inc., introduced a full-feature memory card using 16K bits of 2708-type EPROM memory for expansion of S-100 microcomputer systems.

The new card's 16K of memory are addressable in four 4K groups. A bank select feature, which controls up to eight banks of memory, allows any 4K group to be addressed to any 4K boundary.

Features of the card include fully buffered data and address lines; on-board regulators and heat sinks that allow cool, problem-free operation; and switch-selectable wait states (0-4), the company said.

The printed circuit board, constructed of high-quality glass epoxy with plated-through holes, minimizes problems from cracking and inadequate bonding, Artec said.

Artec's 16K PROM card includes all IC sockets and is available with or without memory chips. The board, priced at \$125 with no memory or \$300 with 16K of 2708-type memory, is available immediately. Individual EPROMs cost \$11 each.

For more information contact Robert Jones, Artec, 605 Old County Road, San Carlos, CA 94070; (415) 592-2740. *Circle No. 87*

LITERATURE

Business Software Directory

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CIRCLE 45

Got an unusual application?

If you use your computer for an interesting, intriguing or unusual application (or know someone who does), our readers would like to hear about it. Why not write up a short (500 to 1000 words), original article telling us about it? Make it light and newsy, and include black-and-white photos if appropriate. Send your submission to Random Access, Personal Computing, 1050 Commonwealth Ave., Boston, MA 02215.

TRS-80 microcomputer users. Programs range from word processors and text editors, to job costing and Amway sales and accounting programs, to total integrated accounting systems including payroll, general ledger, payables and receivables, billing and mailing list processing. Also available are numerous special purpose scientific and engineering programs, and record programs for dentists and doctors. The directory includes sources for CP/M and associated applications programming now available for TRS-80s. Price is \$5 from Tarzac/Computer Products, Box 10203, Norfolk, VA 23513; (804) 853-2304. *Circle No. 115*

New Computer Catalog

Newman Computer Exchange (NCE) has published a new free catalog describing both their inventory of mini-computers and peripherals, and their product line of microcomputers, ter-

minals and peripherals.

The microcomputer section contains photos and text presenting what's new in personal computing, including the latest manufacturers' information and specs. Featured are the Apple II and the Pet along with the newest Pet accessories and disks. Other computers, computer peripherals, supplies and books are described as well. Five pages are devoted to terminals with instructions explaining how they may be leased or bought outright.

A free copy may be obtained by writing to: Newman Computer Exchange, Inc., P.O. Box 8610, Dept. LBUP, Ann Arbor, MI 48107. *Circle No. 117*

Mass Storage for TRS-80

"Mass Storage Systems for the TRS-80" describes cassette systems, mini-floppy disk systems, full-size floppy disk systems, data cartridge, high speed cassette and hard disk systems.

Relative advantages and disadvantages of each system are discussed in detail. Aspects of compatibility, software availability, cost, ease of operation, future advantages, reliability and versatility are examined. Copies of the booklet are free from Parasitic Engineering, Box 6314, Albany, CA 94706. *Circle No. 113*

Two Catalogs

Heath/Schlumberger offers two catalogs of interest to personal computerists. The latest Instruments Catalog features fully assembled and tested computers and peripherals as well as electronic test equipment. The 96-page Heathkit catalog includes kits for personal computers as well as other electronic kits. In addition, the Heathkit catalog offers programming languages and applications software for the H8 computer.

Both catalogs are free. Write to Heath/Schlumberger, Benton Harbor, MI 49022. *Circle No. 111*

ADVERTISERS' INDEX

Circle Number	Page
39	Advanced Access Group 89
1	Anadex C-2
41	August Automation 72
17	Automated Computer Software Service 49
14	The Bottom Shelf 31
10	Cload Magazine 20
42	Comprehensive Computer Systems 72
5	Compusoft 4
29	Computer Components 81
38	Computer Information Exchange 87
18	CPU Shop 50
12	David McKay 58
32	DC Software & Computer Products 83
25	Dr. Daley's Software 78
34	Data/Print Publishing 84
33	Datasearch 83
28	Dilithium Press 80
30	The 80-US Journal 81
21	Electronics Center 69
36	Electronic Specialists 85
24	Gaudeus Magazine 77
16	Hayden Book Company 37
13	H&E Computronics 29
27	Hobby World Electronics 79
31	Information Technology 82

35	Interface 2 85
37	Lifeboat 87
3	Mad Hatter Software 2
40	MicroDaSys 89
23	Midwest Scientific Instruments . 76
8	Mission Control 10
3	3M/Data Processing 3
20	M.U.S.E. 69
6	Netronics R&D 6

22	Newman Computer 70
7	NRI Schools/Electronics Div. . . 21
47	Ohio Scientific C-4
	Personal Computing . . . 25, 91, 35
2	Personal Software 1
15	Racet Computers 35
92	Radio Shack 43
45	Transnet 72
26	TSA Software 78

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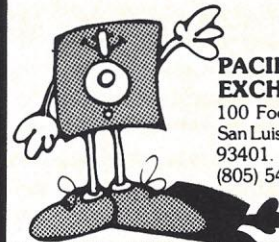
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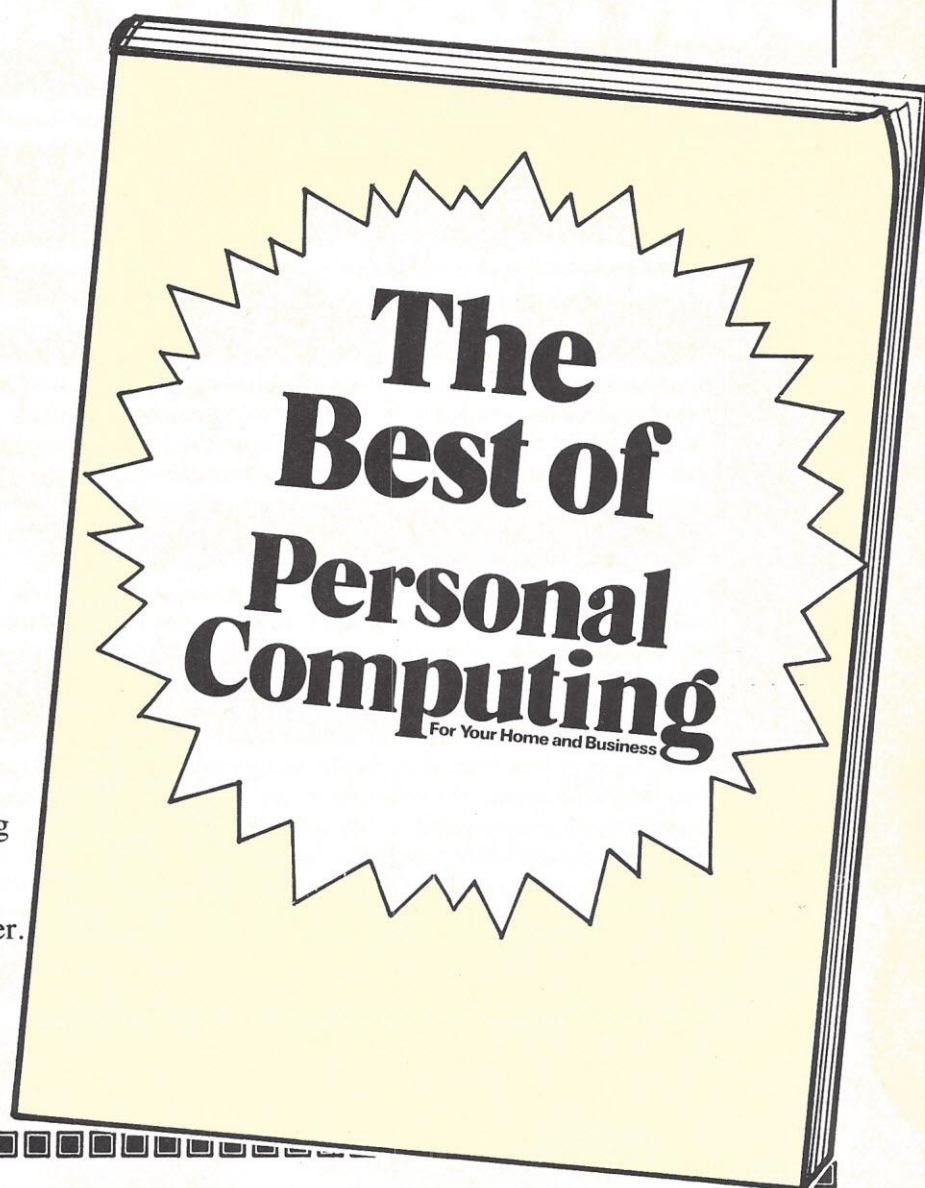
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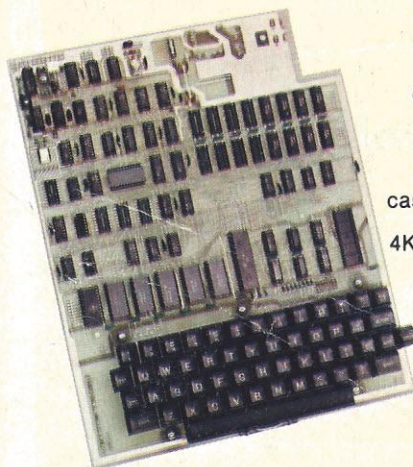
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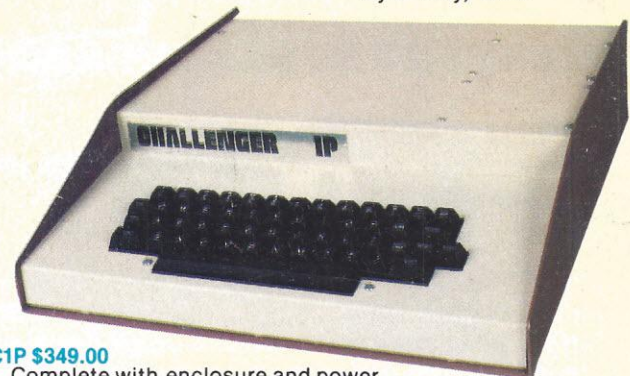
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